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# AUTOMOTIVE INDUSTRIES

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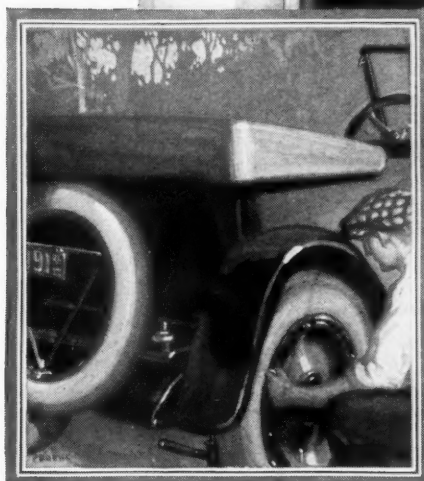
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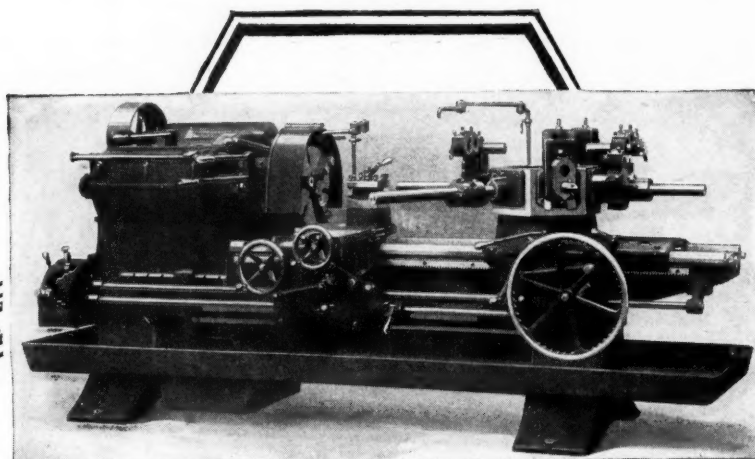


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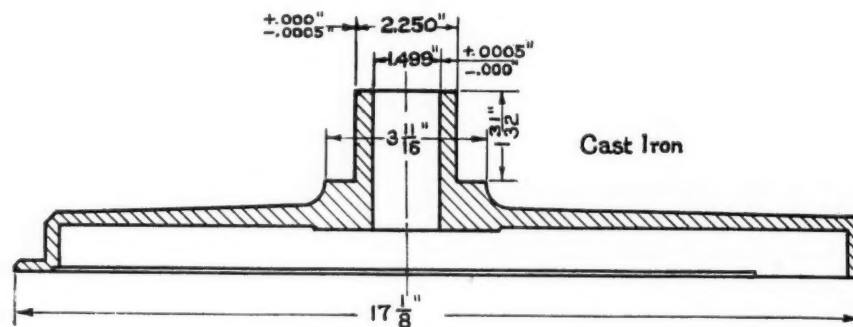


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INDIANAPOLIS: 940 Lemcke Annex

BUFFALO: Iroquois Building  
DETROIT: 5928 Second Boulevard  
DAYTON: 518 Mutual Home Building

# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

VOL. XLVI.

NEW YORK—THURSDAY, JUNE 15, 1922.

No. 24

## 252,000 Record Production in May. What Next?

Factories swing into June at full speed. Prices firm. Inventories held at lowest point. Sales in last six months depend largely upon farmer. Coal strike and threatened rail walk-out unfavorable aspects.

By James Dalton

**E**VEN the leading factors in the production of automobiles have been astounded at the aggregate output of 252,000 passenger cars and trucks in May, which exceeded the highest previous mark by 32,000. This total may be enlarged when complete figures are available. All factories swung into June at full speed and are forcing production to keep pace with demand. It has been impossible to accumulate reserve stocks of passenger cars.

Although the industry naturally is gratified that it is operating at capacity, it is felt in the more conservative quarters that the pace is too swift. It has resulted in many manufacturing problems which would not have become important with a somewhat smaller output. These various factors, none of which is particularly serious in itself, have combined to increase costs considerably.

Stock chasers, shipments of parts by express, orders by telegraph and premiums for raw materials,

all cost money and add to the expense of turning out motor vehicles on which the unit profit is much smaller than it was before the era of keen competition forced by business depression. Prices of parts are somewhat stronger because the parts manufacturer, lacking long term commitments, has to buy in comparatively small quantities and pay stiffer prices than otherwise would be required.

While the cumulative effect undoubtedly has been to increase production costs, it has had a stabilizing effect on retail prices and few revisions are in prospect except perhaps in the truck field, where the return to normal conditions has not been completed.

While there is no likelihood of further recessions in passenger car prices, it is equally unlikely that there will be any general increases. Whatever upward trend may become apparent will be caused by the necessity of returning a profit in the face of mounting manufacturing costs.

**H**ERE is the 1922 car and truck production record which convinces even the pessimist that the automotive industry has come back. May was the biggest production month in the history of the industry.

January .....	90,486
February .....	129,500
March .....	173,342
April .....	218,546
May .....	252,000

While there is no likelihood of further recessions in passenger car prices, it is equally unlikely that there will be any general increases. Whatever upward trend may become apparent will be caused by the necessity of returning a profit in the face of mounting manufacturing costs.



The most popular topic of discussion within the industry is the outlook for the remainder of the year. It is not to be denied that it is exceedingly bright at this time. There is not the slightest sign of a falling off in demand for June and it promises to be one of the big months of the year.

Parts makers report that commitments for July thus far received are only about 50 per cent of the total for June, but this is no barometer of the ultimate business they will get. Unless there is a radical change in the custom which has prevailed for the last year, fully half the total volume of July business will be booked between June 15 and 20.

Vehicle manufacturers are determined to keep their stocks down to the lowest possible point, which is a wise procedure. It has been largely responsible, however, for shortages of essential parts. It has been impossible for parts makers to make deliveries in the quantities desired because they have been unable to place raw material commitments far enough in advance to meet the last minute pressure.

Many automobiles are being shipped from Detroit lacking minor parts. When the parts are received at the factories from the makers, they are shipped by express to distributors and the cars are equipped in the service stations of dealers and distributors. By resorting to this plan shipping delays have been cut down.

While it is the general expectation that July will bring a slowing up in sales, the volume of business will depend largely upon the farm market. There is every reason to believe there will be a heavy demand in the agricultural districts as soon as the harvest is well under way.

Records of one company making a low-priced car show that nearly 25 per cent of its sales already are being made to farmers. This undoubtedly is higher than the average, but it is certain that farm sales are larger even now than they have been at any time in two years. There appear to be only two states in which sales are slow. They are Maine and Georgia, and business is improving rapidly in the former.

Truck sales in the farm states promise to be relatively larger than those for passenger cars. There is a crying need for new equipment, and the market for motor vehicles in the agricultural districts scarcely has been touched thus far. This fact will become apparent when the farmers really begin to get their debts cleared away. They still are heavily obligated to their banks and a large proportion of the sales this year will be on an investment basis. The volume of sales will be dependent in large measure upon the farm market, not only in July but also in August and the later months of the year.

Up to this time the automotive industry has been far in advance of all other industries except building construction, iron and steel, in the process of recovery from the depression. Now other industries are swinging into line and the volume of business as a whole is expanding rapidly. The natural result is a material increase in purchasing power and this will be reflected to a considerable extent in purchases of motor vehicles.

There already is speculation concerning the probable total production of the year, but it is more or less idle. The total for the first five months was approximately

857,000. It is practically certain that the million mark will be passed before the end of June. The total for 1921 was 1,668,550. It will be necessary to average only about 100,000 a month for the remainder of the year to equal this mark. July and August were the biggest months last year, with 176,336 and 180,781, respectively. The totals for the other months were: September, 158,314; October, 147,544; November, 116,349; December, 78,995. It is perfectly logical to assume that the total for the last six months of 1922 will be as large as for the same period in 1921, and if it is no larger the output for the year will aggregate between 1,850,000 and 1,900,000. It may reach the 2,000,000 mark.

Even if 2,000,000 motor vehicles are turned out in 1922, it will exceed by only about 300,000 the total for 1921. This is rather remarkable, because few companies could be found which would admit last year that business was good, and this year

all unite in declaring it wonderful. The difference probably won't average more than 25,000 cars a month.

While the industry is running at capacity, manufacturers will be wise if they consider some questions beyond the problems of immediate production. One of these is the coal strike. Up to this time it has had practically no effect upon industry, but unless it is settled soon it will begin to exert a most malign influence. Reserve stocks are rapidly dwindling

and the output of non-union mines is only a drop in the bucket. Even if reserves last throughout the summer, a suspension of mine work for three or four months cannot fail to prove serious next winter.

There are rumblings of a strike among the railroad workers whose wages will be cut if the orders of the Railroad Labor Board are carried out. Strike ballots now are being prepared. It is generally considered improbable that there will be a walkout, but if there is it will have a disastrous effect with the country just recovering from a long period of depression. Coupled with a prolonged coal strike it would be little short of a calamity.

Regardless of the position taken in relation to strikes, it is scarcely to be wondered at that railroad workers do not exactly welcome a reduction in wages just at a time when the automotive and other industries are raising their wage scales because of a scarcity of labor. Commodity prices are strengthening and there are no indications of a further fall in the cost of living in the near future. It is more likely to advance.

There are reports from Detroit that some manufacturers contemplate keeping their plants running under heavy schedules late in the year to pile up stocks of cars in preparation for a 1923 demand which they expect will be larger than that of 1922. Long range predictions are dangerous, but there is absolutely no reason to expect that sales of motor vehicles next year will be any larger than this, except in the great agricultural districts. It is more reasonable to expect that they will be smaller.

Another dangerous expedient would be the building up of large inventories. Big supplies of materials, with a more or less uncertain market, are a distinct menace, and it is possible for them to eat up the profits of a year.

While the industry is running at capacity, with no sign of a diminution in demand, it will be unwise to cast caution to the winds and accept the theory that there is no bottom to the market.

### July Prospects Bright

**P**ARTS makers reports that commitments for July thus far received are only about 50 per cent of the total for June.

This is no barometer, however, of the total business they will get.

Unless there is a radical change in the custom which prevailed last year, fully half the total volume of July business will be booked between June 15 and June 20.



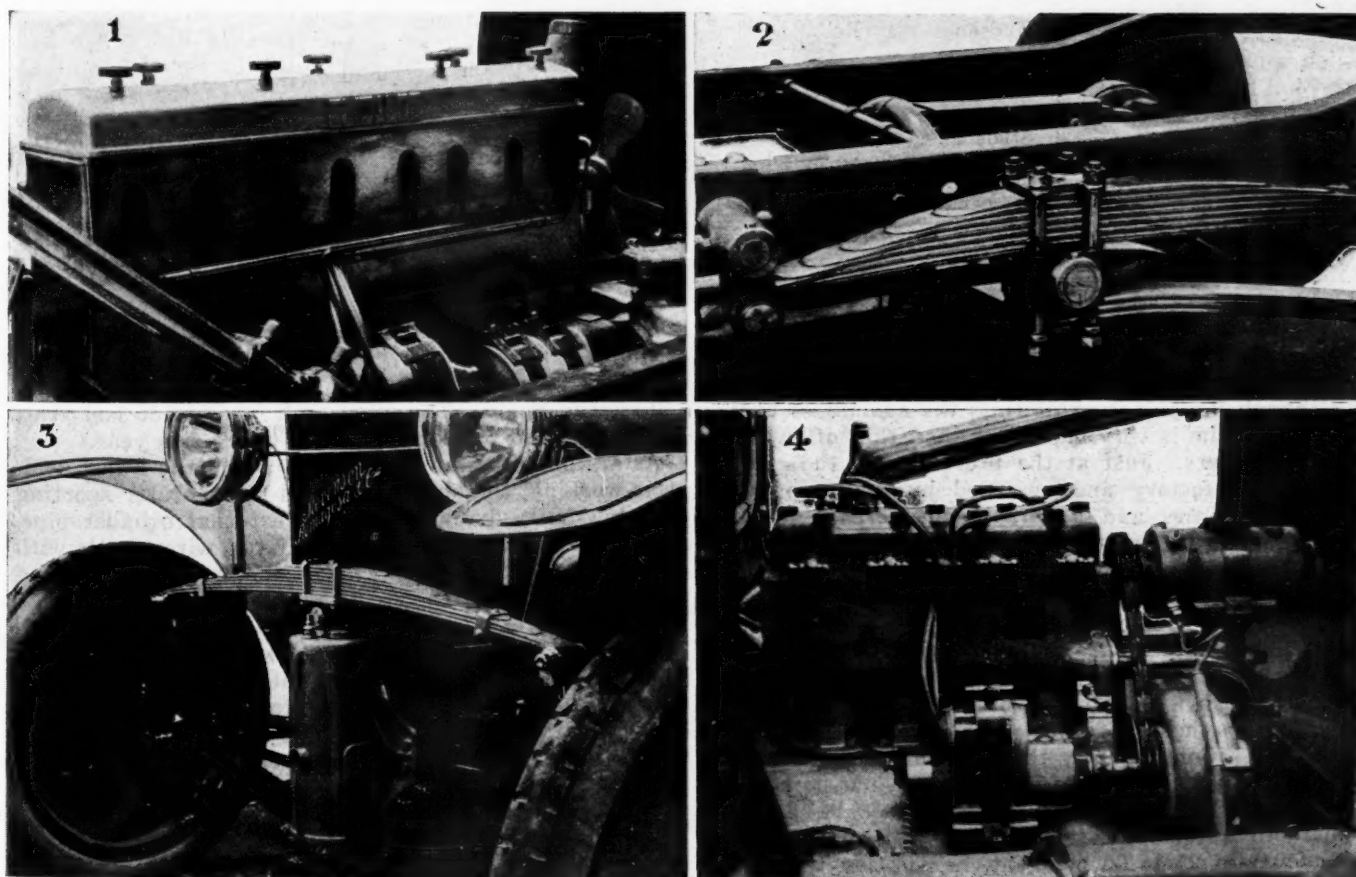
# Spanish Show Forecasts Early Trade Revival

Last year was one of the worst in the Spanish automotive industry. 1922 marks business revival. Increased taxation threatened, but may not go through. Excess car stocks have been cleared out. Spanish dealers for American cars make many detail changes in equipment for local trade.

By W. F. Bradley

**A**MERICA, France, Italy, Germany, Austria, England, Belgium and Spain, represented by 73 different makers of passenger cars and trucks, are united in the first international automobile show to be held in Spain since the war. This is the only show in Europe open to all comers and having a really international character, for the Allies and their ex-enemies have not yet consented to exhibit under a common roof in their respective territories.

The show has been got together on the initiative of the Spanish dealers and traders as an aid to sales at a time when business conditions are not of the best. No single hall in Barcelona was big enough for an exhibition of this nature, but fortunately the Modern Art Palace, to form a part of the electrical exhibition of 1925, was sufficiently advanced for it to be completed in time for the automobile show. The floor space of this show is 150,000 sq. ft., the location is convenient and the approach imposing.



1—Ellzalde 8 cylinder in line engine with detachable bronze head. 2—Entirely new type of rear spring suspension on Unic. 3—Front spring suspension on Stevenson. 4—New Unic engine with fan on generator shaft

America dominates the Spanish show, for of the 73 makes of automobiles on view 24 came from the United States, 17 from France, 10 from Germany, 7 were of Spanish origin, 4 each from Belgium and England, 6 from Italy and 1 from Austria. The accompanying list of exhibitors comprises only car-producing firms, and ignores accessory makers and dealers and tire firms.

**T**HIS show is a direct appeal to the buying public, and not merely an effort to get dealers in touch with manufacturers; consequently it has been laid out to be as attractive as possible to potential purchasers. There is a light, gay note about it, not noticed elsewhere, created by festoons of flowers, plants, fountains with goldfish and thick beds of carnations around the cars. Never at any time during the first four days the show was opened could the same crowds be seen as at the London, Paris or Berlin shows, but probably this is merely due to natural temperament, for the Spaniard is, above all, an enemy of the strenuous life and cannot by any force on earth be induced to hustle or to forego his siesta.

Don Narciso Masferrer, general show manager, stated that this exhibition had been put on foot, at the tail end of a period of depression, in the belief that it would bring along an important revival of trade. Last year was one of the worst in the Spanish automotive industry, but there are indications that 1922 will mark a distinct revival and probably bring the total number of sales up as high as for the year 1920.

Before the war the best selling cars on the Spanish market were of French construction, the lead being held by Renault, followed by Panhard-Levassor. This year Panhard-Levassor has not even taken a stand, and although Renault is exhibiting, the amount of business done by him is very much less than that of several American makers. Just at the present time the situation is unsatisfactory and unsettled by reason of the high import duties and a threatened increase in the automobile taxes. Between France and Spain there is a tariff war which makes it practically impossible for French makers to sell on the Spanish market. This state of affairs cannot continue, and, indeed, there were strong hopes that an agreement would have been reached between the two Governments for the opening of the show whereby French automobiles would be admitted at the same rates as those of other nations. This hope was not fulfilled. Consequently the French are holding on to the market, in the hope of a settlement, but doing little or no business for the time being.

American automobiles imported into Spain pay an import duty of 25 to 30 per cent, in addition to a percentage for gold value. English makers, while paying the same duty, are making an effort to get the advantage of the most favored nation clause.

The Spanish market is the least developed of all in Europe, but one offering important potentialities and which will be the most keenly fought for by American and French firms when the latter can again enter on an equal footing. In the meantime American dealers are strengthening their position. General Motors products are generally well handled, and Buick is the best selling car on the Spanish market at the present time. Cadillac, being a more expensive model, cannot be sold in the same numbers, but has been well introduced by the James M. Nahon Co.

Cars are sold in Spain more as a luxury than because of their transportation value, and as a consequence the market has to be handled in quite a special manner. The use of automobiles is confined to cities and to individual regions possessing good roads. There is no use of automobiles for long distance traveling, such as is common in France, for while the roads may be good

in spots these good places are divided off from one another by almost impassable stretches. Even in the cities automobiles are employed very considerably merely for parading and not for any real utility purpose. Because of this state of affairs a lot of attention has to be given to the individual requirements of clients. A realization of this fact is responsible, in a very large measure, for the success Buick has had on the Spanish market. Abaday, the Buick dealer, partially rebuilt the cars received from the factory and specialized in custom bodies. At first it was declared these Abadal-Buicks were not looked upon very favorably by the

#### EXHIBITS AT THE BARCELONA SHOW

America	France	Germany	Spanish
Chevrolet	Ariès	Benz	David
Stutz	Berliet	Bussing	Elfe
Mitchell	Bugatti	Daag	Elizalde
Cletrac	Chenard-	Krupp	Espana
Federal	Walcker	Loreley	Hispano-
Ford	Citroen	Mercedes	Suiza
Buick	De Dion	N. A. G.	Landa
Cadillac	Bouton	Opel	Victoria
Chandler	Delage	Stoewer	
Cleveland	Lorraine-	Faun	
Cole	Dietrich		
Dodge	Peugeot	Italy	England
Essex	Renault	Diatto	Crossley
Harley-	Rochet-	Fiat	Lanchester
Davidson	Schneider	Isotta-	Armstrong-
Hudson	Rolland-	Fraschini	Siddeley
Hup	Pilain	Lancia	Austin
Indian	Salmson	Itala	
Overland	Saurer	Scat	
Packard	Turcat-Méry		
Studebaker	Unic		
Templar	Vermorel	Austria	Belgium
Maxwell		Steyr	Minerva
Mercer			Excelsior
Apperson			Metallurgique

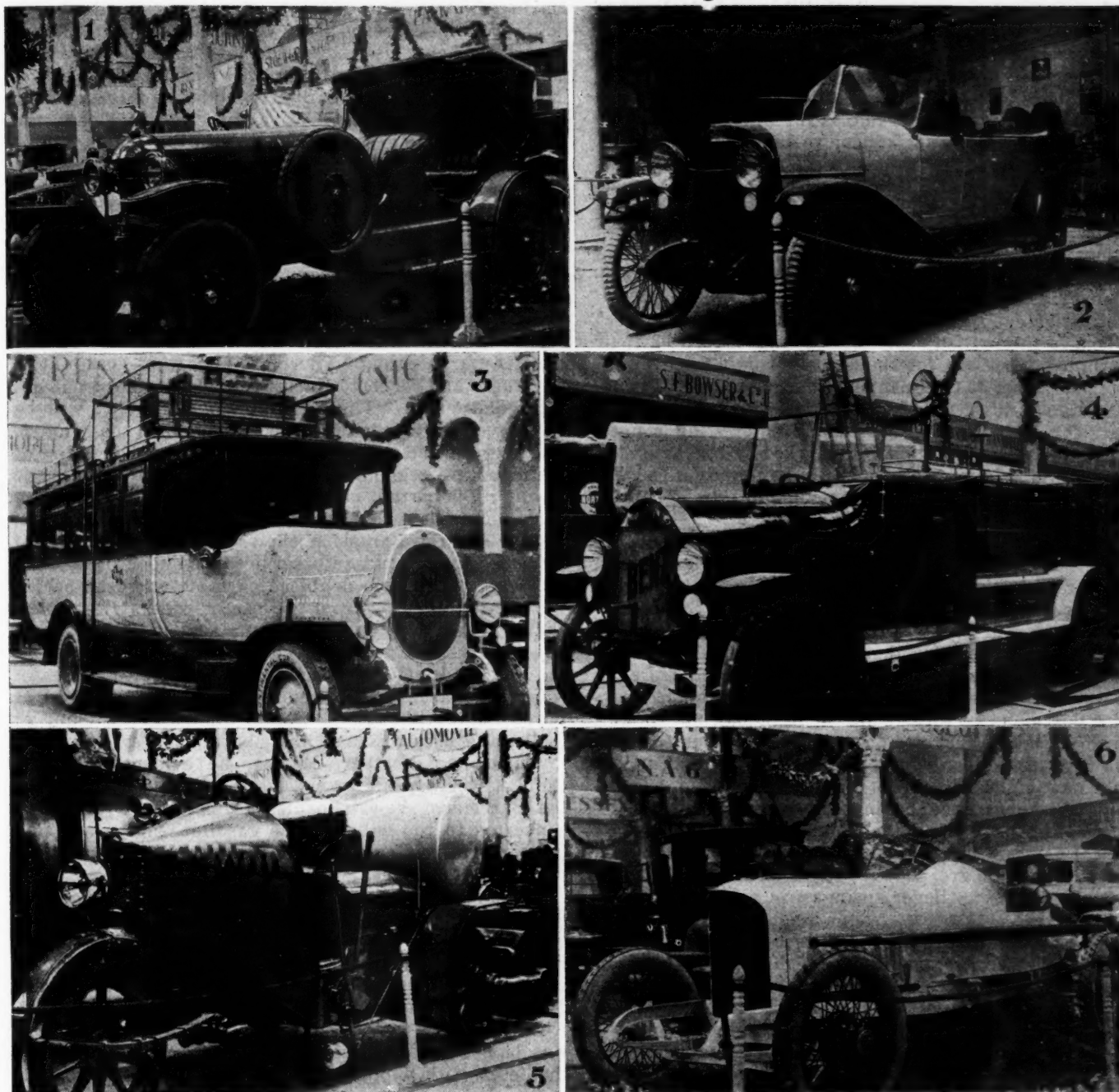
home factory, but when it was realized that this method of doing business was necessary in Spain, complete support was received from Michigan. In 1920 Buick sold 340 cars in Spain. The number dropped to 80 last year, but is expected to reach the 1920 figure this year.

As an indication of the lines on which the Buick dealer is working, the show contained a two-seater sporting type low-built six-cylinder, with external exhaust pipe, pointed cowl on the top of the radiator, wire wheels with clincher bead tires, the whole constituting a sporting proposition very attractive to Spanish speedsters.

**A**NOTHER example was a rebuilt six-cylinder Buick phaeton with changed radiator, hood and wheels, which was offered at 35,000 pesetas compared with only 18,000 for the stock job as received from the factory. The higher-priced car was a better seller than the stock model.

General Motors products are not all in the same hands. Thus the Cadillac is handled by the James M. Nahon Co. of Madrid, who are working on the same lines as Buick. Mr. Nahon told the same story as the Buick representative, namely, the necessity of giving individual attention to Spanish clients and making detail changes when-





1. Stevenson with open phaeton body. 2. Four seater, sport type body on 10-15 h.p. Fiat chassis. 3. N. A. G. bus. 4. Benz fire engine. 5. Krupp street sweeper and waterer. 6. Buick rebuilt to suit Spanish taste

ever necessary to effect sales. Mr. Nahon declared that the Cadillac Company had fully realized the importance of this line of action and gave him full support. Last year, during the slump, these dealers were overstocked with the old model. These stocks had been cleared out at cost price and the present year had begun with very good prospects. The Spanish Royal Court has 10 Cadillac cars purchased from American army stocks. These 10 cars are about to be traded in for the latest Cadillac model.

"Although the Spaniard realizes that he is never given delivery of a car with show finish," stated Mr. Nahon, "it pleases him to see such a car on the stand. For this show we took a standard Cadillac chassis and plated and polished every part of it; the job took a long time, and it cost money, but it certainly helps to bring business." The Cadillac dealers lay themselves out to make detail changes on their cars, such as fitting wire wheels,

clinchers bead tires, right-hand drive, special wheel carriers, etc. Low built, racy, sporting type bodies are in demand and are specialized in to meet the requirements of clients.

There is a threat at the present time of increased automobile taxation which is having a certain effect in restricting sales. The Government proposal is being fought by automobile interests, and there is hope that the increase will be staved off. Taxes are based on engine size, but there seems to be no real control, such as a sworn statement by the manufacturers or the lifting of the cylinders to measure bore and stroke, with the result that individuals often get cars accepted at very much less than their official horsepower. Merely as an indication of the rate of taxation, the 11 hp. Delage, which is a medium size car according to European standard, pays 280 pesetas a year. The 30-hp. six-cylinder Delage, a high grade full-sized car, pays 520 pesetas a year. The

local and state taxes paid on a Cadillac were declared to be equivalent to \$320 per annum.

Conversation with dealers elicited the fact that German competition was not taken very seriously, for although there is the advantage of low exchange rates and the import duties are the same as for American cars, the German products do not appear to be handled on right lines. Italy is very well placed with advantageous exchange rates, good facilities for shipping and a type of car suitable for Spanish conditions. Fiat, among the Italians, has captured the great bulk of the Spanish business, the other Italian firms selling in limited numbers. The fact that Fiat has furnished motor transportation very considerably to the Spanish army helps in doing private business.

Some of the British dealers have been helped by their aviation connections, for English airplane firms are supplying machines to the Spanish Government and this connection helps to introduce automobiles. Armstrong-Siddeley, for instance, has secured an interesting connection on the Spanish automobile market by reason of the fact that its aviation engines are to be found on English planes sold to Spain. The same applies in a certain measure to Rolls-Royce.

Spanish automobile manufacturers are outnumbered on their own market by foreign makers as a group and by several individual nations. There are certainly many more French than Spanish cars in use in Spain, and doubtless a still greater number of American automobiles. Hispano-Suiza is the best known of the Spanish makes, but this reputation has been secured more by the work of the company in France than by the products of its Barcelona factory. Elizalde, although not as well known abroad, is just as important in the home country. This firm took advantage of the show to present an entirely new eight-cylinder in line automobile of exceedingly neat appearance, having as one of its outstanding features the use of a detachable bronze head carrying vertical valves. The size of the engine is 70 by 130 mm. Chassis features are four wheel brakes with a servo mechanism and cantilever springs front and rear.

**E**SPANA is another Spanish firm little known outside its own territory, producing a high grade car costly to build and having a certain general resemblance to the Hispano-Suiza. One of the mechanical novelties of the show was the Baradet-Estève turbine engine, a Spanish invention, evidently of a somewhat experimental nature, but regarding the construction of which no details could be obtained.

Among the foreign cars the only entirely new model was a 10 hp. chassis from the French Unic Company.

During the last three years this firm has specialized on a double cantilever rear spring which allows of the Hotchkiss drive being used. On the latest model there is a combination of the cantilever with the forward portion much shorter than the rear part, and below this a quarter elliptic spring with three leaves of equal thickness, the center one having a rolled eye. The engine is a unit construction job with detachable head, both of which features are new to Unic.

**T**RUCKS are not as well represented at Barcelona as are passenger cars, and in this section America has given way numerically to Germany. Packard has a pneumatic tired truck on exhibition, Ford shows one-tonners and Federal has a small exhibit. The French display in this section is rather meager, the British is non-existent, and the German is strong. There are important possibilities for trucks and for motor buses, but the Spaniard has not yet realized this. The easiest field to develop will be motor bus services both in the cities and in the country. Railroad service, on the whole, is poor, and in many of the mountain regions immense detours have to be made to link up important centers really only a short distance apart. It is here that the motor bus gets its advantage. On the day the Barcelona show was opened a Spanish-British company put into service a number of Tilling-Stevens London-type double decker motor buses, which were used for trips from the center of the city to the show. The intention is to put a fleet of 200 of these buses on the streets of Barcelona in order to supplement the now inadequate electric trolley car service.

Cletrac was the only American tractor to be seen at Barcelona. Although Ford has an assembly plant at Cadiz, and uses this as a distributing center for Spain, Portugal and Northern Africa, he evidently did not think it worth while to put his tractor on exhibition at the Barcelona show. Spanish farmers have yet to be converted to the value of the gasoline engine and any tractor firm coming into this market must be prepared to do a lot of pioneer work.

There is an indifference to the good road movement in Spain which stands out in sharp contrast to the progressive attitude of surrounding countries. On a road journey from Paris to Barcelona conditions on Spanish territory were reminiscent of those prevailing in the middle-west states of America fifteen or sixteen years ago. A few portions were good, but the majority of the road was bad and some stretches were in such a condition that even with a big, well-sprung car it was impossible to travel at more than six or seven miles an hour. In the villages conditions were worse than on the open road; in the towns good surfaces were encountered.

**T**HERE are at least four ways in which buses may become a useful element in the transportation scheme of New York City:

1. They may be used to furnish special route service for segregated groups of patrons.
2. They can supplement existing lines by rendering cross-town or circumferential routes.
3. Accommodate short-haul traffic in congested centers in place of surface cars.
4. They can develop outlying areas of the city by furnishing transportation before rapid transit lines can be built with profit.

These suggestions were made by Daniel L. Turner, consulting engineer to the Transit Commission of New York City, in a paper recently read by him before

the National Automobile Chamber of Commerce.

Mr. Turner showed that the transit problem of New York is one of mass transportation, illustrating it by the statement that the Fifth Avenue buses carry only 2 per cent of the total and that a complete substitution of buses for existing transit facilities would require approximately 47,000 buses of the Fifth Avenue type, a number which is twice as large as all the buses now in use in city transit service in the United States. Obviously the avenues could not possibly handle this number of buses.

While conditions in New York City are not representative of general conditions, Mr. Turner showed the necessity of close analysis of transit problems which is applicable to all cities.



# 1922 Will Surpass 1919 in American Export Trade

More automotive firms working with Automotive Division of Bureau of Foreign and Domestic Commerce. Organized efforts increase foreign business. Dealer associations in foreign countries ask Division Contact Committee for merchandising suggestions. Increased activities July 1.

By George E. Quisenberry\*

SEVERAL hundred American companies manufacturing or distributing automotive products have been listed within the last few weeks as additions to the Exporters' Index, maintained by the Bureau of Foreign and Domestic Commerce, in connection with its efforts to foster export trade. This report was made by Gordon Lee, chief of the automotive division, at the meeting of the Foreign Trade Contact Committee, held in New York on June 12. This committee was organized in April at Washington, and composed of representatives of the foreign trade committees of the various associations and trade groups.

"The number of automotive firms now working with the division has been more than doubled," Lee stated. "This gives an indication of the increasing thought that is being given by the American companies to the necessities of international distribution and also is a measure of the improvement being recorded in our export trading. Despite the heavy demands of domestic markets, which necessitated record production during May, we are steadily increasing foreign shipments, this showing that the various companies are carefully allotting a percentage of output for their dealers in other countries. This tendency is more marked than ever before and is so encouraging that we can expect the year 1922 to be larger than 1919 so far as pertains to overseas trade."

The Contact Committee was formed for the purpose of bringing all branches of the automotive industry into co-operative effort for the furtherance of legitimate export aims and likewise to bring each of the associations and trade groups into closer contact with the division headed by Lee. A booklet, setting forth the development that is being gotten under way and detailing the work of the automotive division, has recently been published by the committee and circulated among all members of

the National Automobile Chamber of Commerce, the Motor and Accessory Manufacturers' Association, the Automotive Equipment Association, the Aeronautical Chamber of Commerce, the Motorcycle and Allied Trades Association, the National Association of Engine and Boat Manufacturers and the Association of Automotive Equipment Manufacturers and other trade groups which participate in the committee effort. In addition, all consular and trade representatives of the Department of Commerce, executive officers of the Department of State and many Congressmen have received copies of the publication, so that there may be the necessary co-ordination of work at home and abroad. A number of individual companies likewise have requested copies of the booklet, the contents of which were published in the April 27 issue of *AUTOMOTIVE INDUSTRIES*, to send to all foreign representatives, distributors and dealers.

Letters were read at today's meeting showing the interest that the effort has aroused in other territories. The automotive dealer associations at Havana, Cuba, and

Sao Paulo, Brazil, both expressed their desire to co-operate with the committee, the Cuban association specifically asking for merchandising suggestions to enable the members to bolster up trade there.

Further progress was reported by Lee of the division's efforts to better its services. Several assistants will be added to the division on July 1, when the governmental fiscal year begins. This is deemed necessary to care for the enlarged work of the division. Cable reports from commercial attaches are now coming through regularly, setting forth conditions as to the automotive trade in the different centers and the division now has under way the publication of distribution and trade analyses of several important buying territories. A compilation of automotive tariff laws has been completed and information in regard to specific countries can be furnished.

\*Managing editor, *El Automovil Americano*.

# New European Taxicabs Are Designed for High Economy

Citroen with small four-cylinder engine, 111 in. wheelbase and 46 in. track and body seating only two passengers has proved highly successful. 3200 Renault cabs with larger engine, same wheelbase, 56 in. track, and four-passenger body are now competing. Relative merits still in doubt. Fords also used in Paris, are handicapped by higher fuel consumption.

By W. F. Bradley

**H**IGH operating costs, traffic congestion and keen competition have necessitated a revision of taxicab design and construction. This is best exemplified in Paris, where gasoline costs are high, where labor charges have increased to almost the American scale, and where the special traffic conditions necessitate a type of cab carefully designed for city work.

Obviously the most suitable vehicle is the one capable of covering the greatest mileage in a given time at the lowest cost, but as to which type best meets these conditions even experts are divided, as is shown by experience in Paris and other European cities. Ignoring the old type pre-war cabs, which either will have to be modernized or submit to the process of elimination, there are two distinct classes in operation in the City of Paris.

Citroen broke into the field about two years ago with a two-passenger cab having a four-cylinder engine of 68 x 100 mm. bore and stroke, or 88 cu. in. piston displacement, a wheelbase of 111 in. and a track of 46 in. With a body width of 42 in. and an internal length of 41 in., the Citroen taxicab is only just large enough for two persons; it offers limited accommodation for baggage, and the preliminary objection raised against it was that it was too small to be successful.

The answer to these objections was that an average of 90 per cent of taxicab trips are made with only two persons aboard, and by ignoring the 10 per cent with more than two passengers or with heavy baggage a saving of more than 600 lb. in weight could be effected. By reason of this lower weight fuel consumption is decreased and

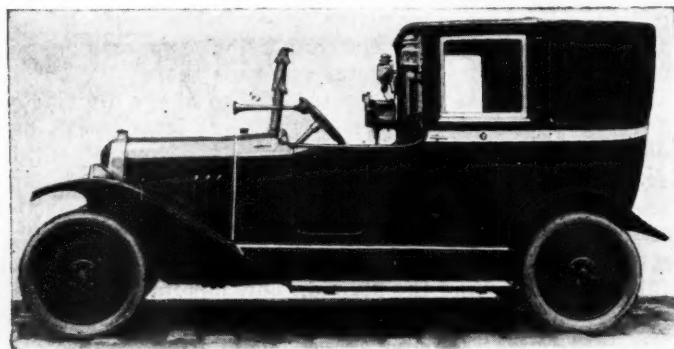
tire cost is lessened, for 710 x 90 mm. size can be used, although an increase of the section to 105 mm. appears to give more economical results. With a track reduced to 46 in. and an overall width of 55 in., this type of taxicab will cover a greater mileage in a given time over city streets than a larger machine. This is a matter of particular importance in Paris and some other European cities having an irregular layout, where traffic cannot be regulated on a block system.

This reasoning appears to have been justified, for, after the public had become used to the small size of the Citroen taxicabs, it selected them in preference to others, and this choice was made very largely because of the time saved in congested traffic over other and larger vehicles. Doubtless, either consciously or unconsciously, this choice was influenced in some measure by the fact that the Citroens had four-cylinder engines compared with twin cylinders for most of the rivals, that they were equipped with electric lighting and were cleaned and better kept.

## The Renault Taxicab

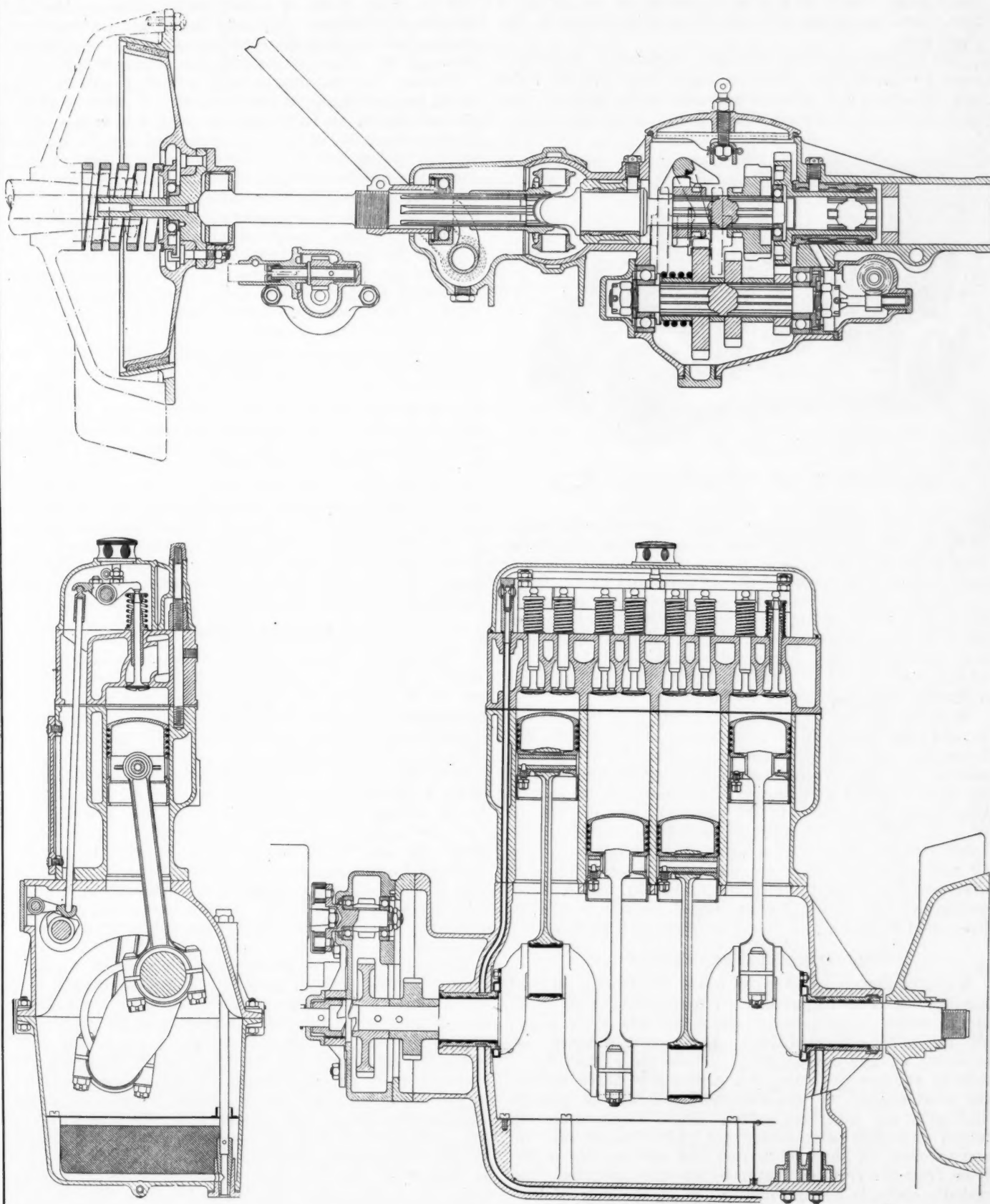
In direct competition to the small Citroens there is now being put on the streets of Paris a fleet of 3200 Renault taxicabs belonging to the Compagnie des Automobiles de Place, one of the most experienced concerns in the European taxicab field. In maximum speed, comfort, and appearance there is nothing to choose between the two. The Renaults have been designed, however, on the theory that for taxicab service a vehicle is required which can carry four passengers when necessary and which possesses adequate accommodation for baggage. Few cases are likely to arise when the Renault taxicab will be turned down because it is incapable of doing the work required of it; even at railroad depots, where the heaviest loads are picked up, it can meet requirements.

Expert critics maintain that this large capacity for service is the weak point of the Renault type cab, for the greater weight and the higher gas consumption compared with a light two-seater of the Citroen type will, it is contended, offset any extra earnings. It is argued, too, that the larger size cab will actually earn less than the small one, for, owing to the greater difficulty it will experience in getting through traffic, it will cover a smaller mileage. This applies particularly in Paris, where no speed limit is enforced, and where the man with the greatest skill and the most suitable type of vehicle maintains the highest average speed. Naturally, the company operating the



The Citroen taxicab, seating only two passengers, has narrow tread which facilitates operation in crowded traffic

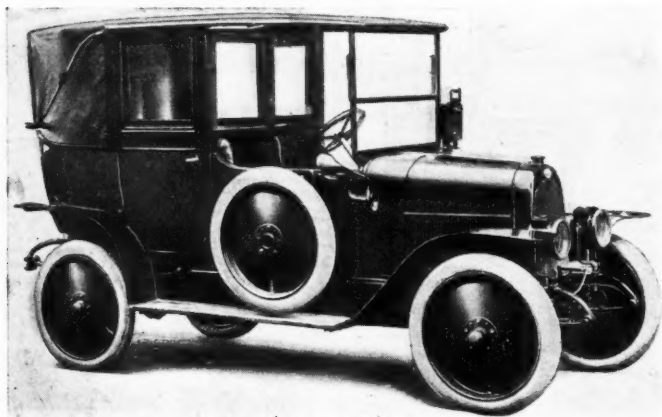




Above, sectional view of new Renault taxicab clutch and gearset. Below, transverse and longitudinal sections of the new Renault taxicab engine with demountable head, in which the valves are carried

Renault does not agree with these contentions, but maintains that a cab of its size is necessary. Only the state of the balance sheets of the two concerns at the end of a few years' operation will determine which view is the right one.

The Citroen type most generally employed in Paris and other European cities has a landaulet body with left hand steering and a door on the right side of the driver's cab; while the panel on the left side is fixed. A limited number



The Fiat taxicab, used extensively in Italian cities, seats four. It has 108 in. wheelbase and 55 in. tread

of high class taxis have coupé bodies. Overall body length is 97 in. and full width of body 47 in.; the height of the body is 51 in. With these general dimensions it is possible to use a rear cushion 41 in. long and 20 in. deep; the height from the middle of the cushion to the roof is 33 in., and from the floor to the roof 47 in. These dimensions are certainly a minimum for a two-passenger general service vehicle. While the wheelbase of 112 in. is normal, the reduction of the overall width to 55 in. gives a decided advantage under traffic conditions.

Mechanically the Citroen taxicab differs little from the normal type passenger car produced by this company. The frame members are heavier and tie rods are fitted to take care of the frame overhang occasioned by the double quarter elliptic spring construction. The engine is the normal type except that the bore is increased from 65 mm. to 68 mm. (3.07 in.). Timing is as follows: intake opens 5 deg. late and closes with a lag of 20 deg.; exhaust opens 30 deg. early and closes on center. Ignition advance is fixed and the compression is 106 lb. per sq. in. Average weight, with driver and two passengers aboard, is 2650 lb. Final gear ratio is 4.4 to 1, and tire size 710 x 90 mm.

#### Importance of Fuel Economy

While maximum speed is 34 m.p.h., the timing adopted has been such as to get maximum economy at 20 to 25 m.p.h., which is the speed at which the cabs most generally run under city conditions. Very accurate figures are available on gas consumption. These show that for a fleet of one hundred cabs over a period of three months the total amount of gas consumed was at the rate of 22.4 miles per American gallon. These results were obtained with the Solex carbureter and straight gasoline and involved all kinds of drivers and various city conditions from the crowded center to the open suburbs. The maker's claim is a gas consumption at the rate of 31.3 m. p. g., and as a comparison with the average for a long period shows, this ought to be easily obtainable with a good driver and under normal street conditions. With benzol the fuel consumption can be cut 10 per cent, but this fuel is not obtainable on the French market at the present time, consequently straight gasoline is used.

The Renault cab has a wheelbase of 111 in., a track of 56 in., an overall width of 65 in., and a total length of 150 in. This allows of a body much more spacious than that on the Citroens. Not only is the rear seat wider and deeper, but two folding seats can be installed and there is room, by the side of the driver, for a large trunk.

Greater size and weight have increased cost, but every effort has been made to keep total weight down by as light a construction as is compatible with the rough service given a taxicab. A certain amount of weight has been saved by using minimum headroom. The height from the ground to the roof is 78½ in., and from the floor of the cab to the roof 55 in. The reduction of 4 or 5 in. in total height, as compared with the old cabs, has been obtained without changing inside height above the rear seat, by putting the body sills below the top of the frame members, so that the floor of the cab is flush with the top of the frame. Other savings are of a structural nature, involving, for example, the use of aluminum in place of iron or bronze for body fittings.

The Renault chassis has been designed throughout with economy in view by men who have had twenty years experience in taxicab operation. Renault makes practically all the parts, but the taxicab company does all its own assembly work. Compared with the usual French practice the engine is large. It has four cylinders of 2.95 x 4.72 in., giving a piston displacement of 129 cu. in. It has a detachable head, overhead valves, with push rods and rockers and a two-bearing crankshaft. Compression is rather high, being 85 lb. per sq. in., but the timing is laid out for high torque at low engine speeds. It is as follows: Intake opens 4 deg. late and closes 20 deg. late. Exhaust opens 30 deg. early and closes on center; this timing is practically identical with that of the Citroens.

#### Relative Operating Costs

This engine, fitted with the Zenith carbureter, has shown a gasoline consumption of 22.9 miles per American gal. on a five-hour run under representative Paris traffic conditions. This fuel consumption must be considered as the minimum obtainable by a skilled driver under these conditions, and is not comparable with the 22.4 miles average on the Citroens in the hands of all classes of drivers. With a driver and two passengers aboard, this cab certainly averages 3300 lb. In view of the frequent positive and negative acceleration imposed by traffic conditions, this additional weight entails at least 15 per cent increase in the gasoline consumption and increases tire cost in about the same proportion. Overloading, which is always a danger in a large size cab, may cause operating costs to go up without any corresponding return to the company.

Compared with the average cab running in American cities the little Citroen shows an improvement of 9 to 10 miles more to the gallon. This in itself is not a deduction of very great value, for it remains to be proved that the small type French cab would be successful under American conditions. It has been proved, however, that this two-seater cab can compete on equal terms with the larger Renault and run nearly 7 miles more to the gallon. Taking 60 miles as the average daily distance run by a cab, and estimating on 1000 cabs in service, the fleet of smaller cabs makes possible an economy of \$304 per day in fuel costs. On the basis of 300 working days in the year the saving in the fuel bill is \$91,200. This is sufficiently important to draw attention to the possibilities of a smaller type lightweight taxicab such as is used in France.

Paris has a certain number of Ford taxicabs in service, these being handled by small co-operative groups, in which the drivers are part owners. Generally the orig-



inal carbureter is replaced by a Solex, with which 19 miles per gal. can be averaged. Equally good results can be obtained with the Ford carbureter in the hands of a skilled driver, but the advantage of the French carbureter is that, when set, it is not liable to get out of adjustment. While the Fords consume more gas than the Citroens, the same carbureter being used on both, they are almost on a par in this respect with the Renaults. Generally the Fords are well handled by men who understand the city and who know where to pick up clients and how to avoid dead mileage. The inferiority of the Fords is most prominent when they have to operate in the heart of the city under very dense traffic conditions necessitating frequent and sometimes very steady use of the low gear.

Italian cities generally, as well as several of the European capitals with the exception of Paris, make an extensive use of the Fiat taxicab, which by reason of its power and dimensions is in the same class as the Renault. The Fiat has a four-cylinder, 2.7 x 4.7 in. engine (111 cu. in. piston displacement), a four-speed gearset, a track of 55 in., a wheelbase of 108 in., an overall length of 157 in. and a total width of 65 in. These general dimensions allow of a rear seat 40 in. wide by 22 in. deep and also two folding seats facing forward. The body is landaulet type, with the whole of the space by the side of the driver available for baggage. It weighs 3300 lb. with driver and two passengers and its gasoline consumption averages 19 m. p. g.

## High Tension Ignition for Ford Magneto

A HIGH tension ignition system employing four transformers of special design that utilize current from the Ford fly-wheel magneto has been designed recently by Richard Varley.

The principle of the transformer is best explained by reference to the diagram, from which it will be seen that the flux has two paths, one through the leg containing the secondary winding, the other through the horns, air gap and armature. Under the secondary there is another winding called a "choke" coil which, when its circuit is closed and the primary energized, restrains the flow of flux through the secondary and forces some of it through the armature; then, at a suitable point in the cycle, the magnetization of the horns overcoming the tension of the armature spring, separates the contacts, thus opening the choke coil circuit.

The resultant effect of increased flux density through the secondary coil, due in part to the fact that a large portion of the flux that previously took the upper path now passes through the secondary, accompanied by a high rate of change, sets up a voltage sufficient to jump the gap and deliver a current of high amperage, by reason of the small number of turns in the secondary.

Without the choke coil, the voltage in the secondary would have the very low value determined by the turns, as in a simple two-coil transformer. To obtain a pressure of about 6000 volts, usually employed in ignition work, the secondary winding would require a very fine wire, the high resistance and excessively large number of turns of which would reduce the current to an amount too small to be of any practical use for the purpose of ignition.

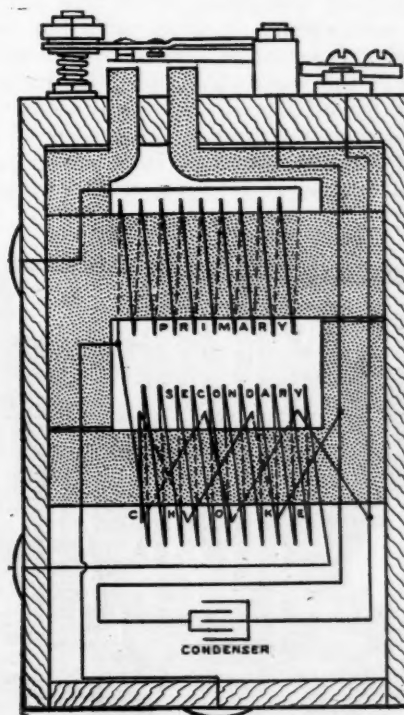
It is said that the sparks obtained by the use of this new transformer have heat values greatly in excess of anything heretofore obtained from any coil using current from the same source.

The inventor has aimed to minimize ignition troubles common in coils of the Ruhmkorff type and has given particular attention to improvement in the trembler contacts in order to give greater reliability to the ignition system.

One of the troubles claimed to have been overcome is that of the burning and pitting of the contacts, which, although constantly going on in consequence of the main current from the generator being interrupted at the vibrator points, becomes very serious when the plugs get fouled by carbon or by reason of a cracked stone or porcelain. When a plug gets shorted, there is much

flashing at the contacts of a Ruhmkorff coil, but the inventor claims there is no sparking whatever across the contacts of his new transformer when the plug is shorted, and no current direct from the generator passes through the contacts at any time. Only induced current passes through the contacts and this is so very small that pitting or burning is unappreciable.

For the installation of the new system on Ford cars advantage is taken of their present wiring, and to further simplify the application, the transformers are made



Varley Transformer. Diagram showing the magnetic and electrical circuits

to the dimensions of regular Ford units. It is claimed that the use of this system gives great improvement in the running of a Ford engine.

These transformers, for use with the flywheel magneto on Ford cars, trucks and tractors, will be manufactured under a license agreement with the Varley Duplex Magneto Co. and will be distributed by the sales department of the Autocoil Co.

# Small Diesel Type Automotive Engine Now in Production

A four-cylinder Austrian engine designed to avoid excessive compression and combustion pressures thus reducing strain on working parts. Auxiliary air compressor and air storage tank eliminated. The Hindl engine can be started by means of a hand crank and operates at a speed of 1150 r.p.m.

**T**HERE are two difficulties which stand in the way of using the ordinary Diesel type engine for automotive purposes. One is the great weight of a multistage compressor required for compressing the air necessary for injecting the fuel under air pressure, and the other, the relative slowness of combustion, which makes the possibility of using high engine speeds seem very remote. The starting difficulties also cannot be neglected. In spite of these difficulties development work is constantly being done with a view to adapting the Diesel cycle to use in small units, for the advantages of its high thermal efficiency and its ability to utilize low priced fuels are fully appreciated.

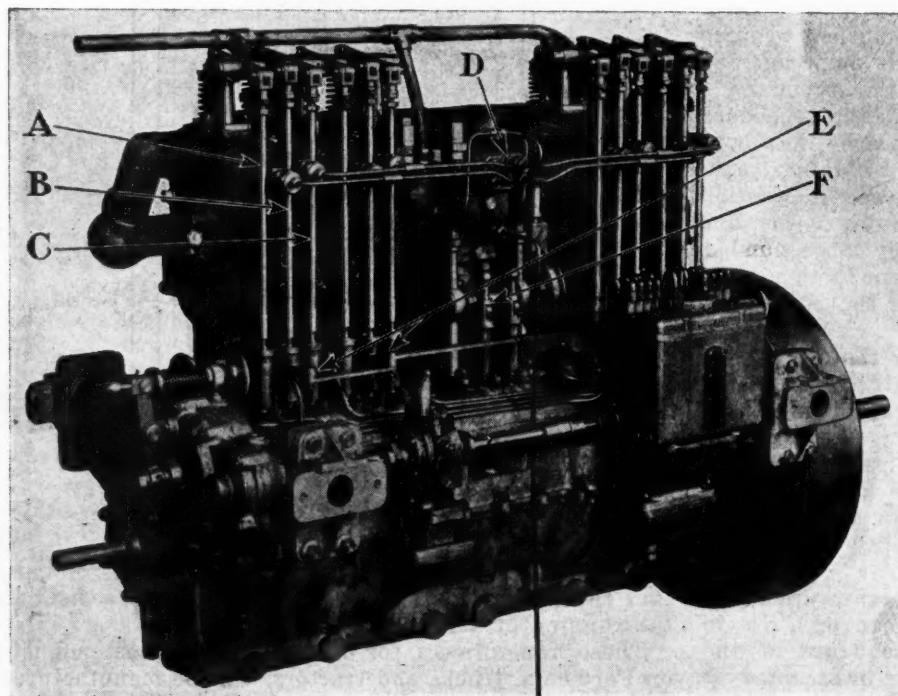
A new design of four-cycle, Diesel type engine specially adapted for construction in small units has been brought out in Austria. It embodies a number of original features and represents the work of Joseph Hindlmeier, a former co-worker of Rudolf Diesel. At the present time the engine is being manufactured in three sizes of the stationary type, a 4½-hp. horizontal, a 7-hp. vertical and a 14-hp. twin vertical engine, at Mödling, near Vienna; a French

company with a capital stock of 2,000,000 francs has been formed at Paris for the exploitation of the Hindlmeier French patent, and we understand that arrangements are being made for the manufacture of the engine in this country.

**I**T is claimed that from an engineering standpoint there is no reason why the Diesel engine cannot be built in any commercial size, however small, but in practice there is a limit in output below which the engine cannot be made practical. This is due to the fact that the Diesel is relatively expensive to manufacture. In large engines the extra cost of construction is warranted by the possible savings on fuel cost, but not so in small sizes. Another difficulty with the ordinary Diesel engine is that a good many breakages of parts are experienced, which are due to the high compression and working pressures. Lubricant from the compressor cylinders sometimes mixes with the air, passes over into the air storage tank, and in time accumulates in sufficient quantity to cause disastrous explosions.

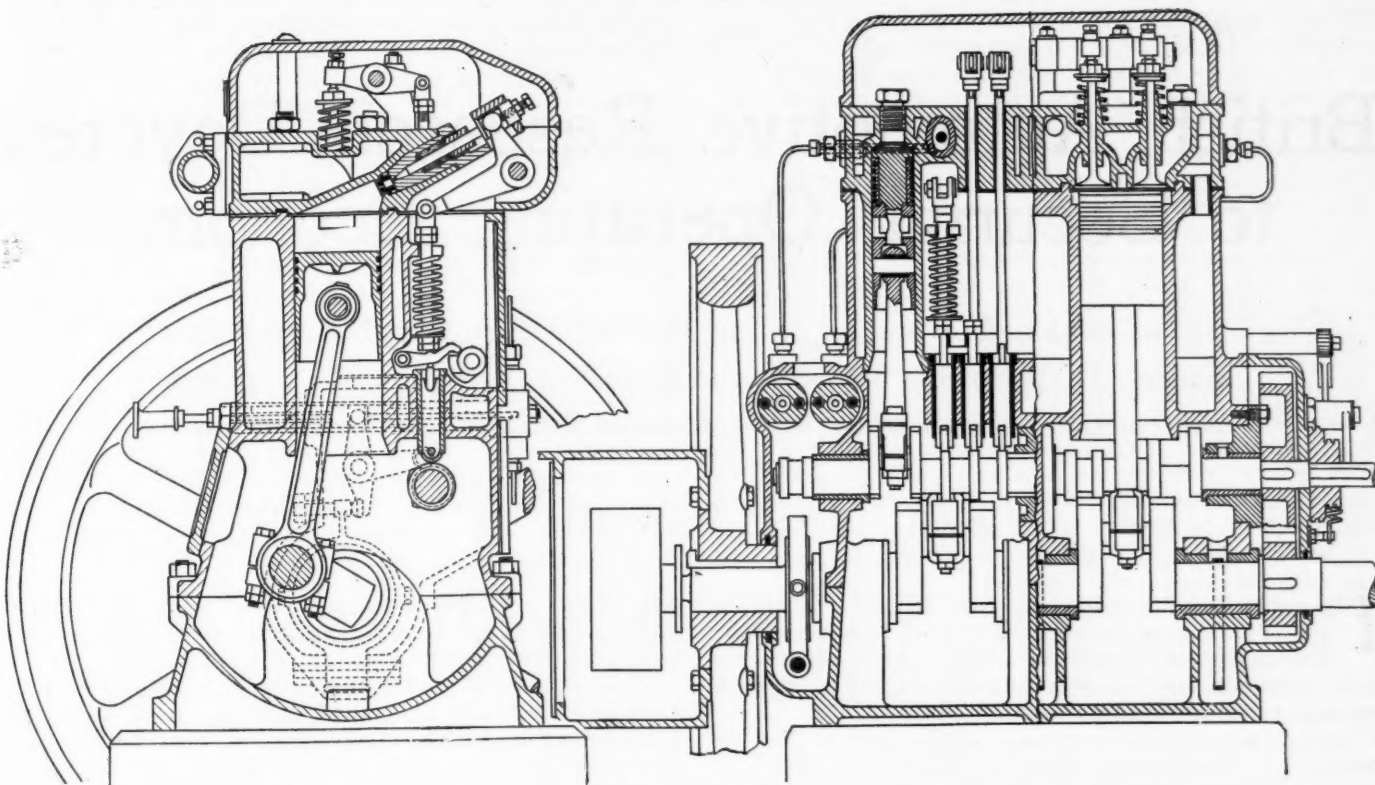
Hindlmeier, in developing his engine, worked with two objects in view, viz., to do away with the excessive compression and combustion pressures and thus reduce the strains on the working parts, and to eliminate the auxiliary air compressor and air storage tank, which tend to complicate the engine.

To do away with the auxiliary compressor, the inventor conceived the plan of compressing a portion of the air of a charge only, rather than the whole amount, to a pressure sufficiently high to insure spontaneous ignition. The air thus compressed is not stored but immediately used in the cylinder, and the need for an air storage tank is thus done away with. This is accomplished by providing a small single-cylinder air pump or compressor integral with the engine camshaft, the compressor being so timed as to deliver a charge of highly compressed air into the main cylinder at the moment the fuel is injected. The fuel is both atomized and ignited by the air charge, and its combustion is completed as it mixes with the air in the main cylinder.



Four-cylinder Diesel engine; A—exhaust valve, B—fuel inlet valve, C—air inlet valve, D—fuel distributor, E—variable lift on fuel inlet controlled by governor, F—fuel pump





Sectional view of Diesel engine showing compressor cylinders mounted parallel to main cylinders

It is readily seen that this system somewhat eases the starting problem. Only a small part of the whole charge needs to be compressed to the high pressure necessary for incuring ignition, instead of the whole charge in the main cylinder, and by using a compression release on the main cylinder the Hindl engine can be started by means of a hand crank. Although the small compressor cylinder must deliver a very high compression, the flywheel weight is sufficient to carry it over dead center when the crank is being turned by hand.

The drawings reproduced herewith clearly show this construction. In the horizontal design the small compressor cylinder is located transversely across the head of the main cylinder, while in the twin and four-cylinder vertical engines the compressor cylinder is located parallel with the main cylinder. Each main cylinder must have a separate compressor cylinder.

Fuel is supplied under pressure by a plunger type fuel pump, from which it is conveyed by small tubing to the fuel admission valve in the cylinder head. This valve is operated from the camshaft in the same manner as the inlet and exhaust valves, but, unlike these, it is of the needle valve type. The engine is governed by a centrifugal governor controlling the amount of fuel allowed to pass on to the injector valve just mentioned. The engine, therefore, is not governed on the hit-and-miss principle, but is a throttling type.

**T**HE compression pressure in the main cylinder is carried at about 400 lb. per sq. in., or at from 20 to 30 per cent less than in the regular Diesel engine. The pressure delivered by the small single-cylinder air compressor is 700 lb. per sq. in.

It is claimed that on account of the lower working pressure in the main cylinder it is permissible to use materially lighter working parts, and this permits of the use of higher speeds. This, therefore, eliminates the obstacle which hitherto has prevented the use of engines of the Diesel type for automotive purposes. The first Hindl engine of the automotive type, of which a photo-

graph is shown herewith, is a four cylinder machine which, we are informed, operates at 1150 r.p.m. This is within the usual range of truck and tractor engine speeds and shows its field of application.

**I**T is obvious from the above description and an inspection of the drawings that high grade workmanship is required on the engine, especially on the compressor cylinder and piston and on the rings of the latter. The pressure required to cause ignition is produced in a single stage, which can be effected only if the workmanship is of the highest grade. Aside from the machining proper, care must be taken that there will be no distortion of the cylinders after completion, and to this end the cylinder castings must be properly annealed.

We have been informed that the parent works in Austria turn out about 300 engines of this type per month and that companies have been licensed to manufacture the engine in Bucharest, Cracow and Brunn. It is obvious that the most likely field of application of this engine in the automotive line is to tractors, railway motor cars, road tractors, road making machinery and motor boats.

### Chain Type Non-Skid Device

**A**N automobile non-skid device in which the circumferential members of the ordinary tire chains are replaced by fabric bands and the cross members have circumferentially grooved cups inserted in three of their links has been invented by Ida V. Benoit. The cups, which in a sample cross member submitted to us are turned from the solid bar, are intended to increase the gripping power of the device, whereas the fabric circumferential members are intended to protect the sides of the tire against puncture and at the same time as an anchorage for the cross members.

The cups have a flat bottom resting against the tire case and the considerable area of contact should minimize wear of the tires.

# British Automotive Research Devoted to Securing Operating Economy

Use of combined oil and air cooling for engines being studied by several parties. Experiments proceeding to further use of light alloys in chassis construction. Much study being given to reducing bus operating costs.

By M. W. Bourdon

**I**N conducting inquiries in Great Britain concerning the objects, progress and results of research in the automotive field—and in almost every other—one finds oneself in every direction up against the barriers of secrecy.

Except in regard to specialized work—such as fuel research—no government office or department makes a regular practice of initiating and conducting research for the general good and disseminating the information thus obtained. We have the National Physical Laboratory, which does not as a rule initiate researches and publish the results but primarily undertakes investigations at the request of other government departments or of private individuals or firms who are prepared to pay the cost—and an extremely high if not an almost prohibitive charge is made as a rule.

In place of initiating research and thus giving direct assistance, the Government prefers to subsidize research associations. However, one of the first stipulations is that the details of researches—their character, object and result—shall be confidential to the members of each association. The amount of the subsidy is to a large extent dependent upon the amount subscribed by members and as a rule represents approximately 50 per cent of the total expended.

**U**NDER this scheme there was formed in 1919 the Research Association of British Motor and Allied Manufacturers, the first of such associations from the engineering industry to receive official recognition and support.

But such is the seeming lack of interest in and enthusiasm for scientific research in the British Motor industry that even to-day there are in the membership less than 15 per cent of the manufacturing concerns.

The policy of secrecy insisted upon by the Government may to some extent be responsible for the apathy of the non-members.

The Association has a well-equipped laboratory and workshops in London, and a capable and enthusiastic staff, but its usefulness even to its membership would assuredly be increased if it embraced the whole or a far larger proportion of the British industry. Equipment for research is costly and, within limits, the larger the bank balance available the better equipped the workers will be and the deeper they can go into the problems which are submitted to them.

Practically all the fuel research work which has been carried on has been related to alcohol and the results of

such study appeared in an article by Herbert Chase in *AUTOMOTIVE INDUSTRIES*, Research Number of June 8, so that repetition is unnecessary.

The commercial possibilities of gas producers to provide fuel for trucks and other heavy forms of motor vehicles have received a good deal of attention of recent years, and particulars of several British designs and results of working appeared in *AUTOMOTIVE INDUSTRIES* last year. Costs of running have certainly been shown lower than those with gasoline, but the need for carrying a somewhat involved plant in place of a mere gasoline tank seems likely to be a determining factor in preventing the system from becoming widely used.

It may be said, however, that it is advocated in this connection that the use of charcoal produced from vegetable waste and brushwood should be investigated, for it is said that in certain parts of the world—notably Egypt, Uganda and similar semi-tropical and tropical places—a fuel of this kind derived from local sources and used in a gas producing plant would open up fresh possibilities of transport owing to the abundance of raw material for the production of charcoal.

**S**O far as can be ascertained, no other investigators are endeavoring to carry Ricardo's experiments further in the matter of super-charging; at all events, no information concerning anything of the kind has been made known. Nor has research on the lines of improved vaporizing systems carried matters appreciably further in this direction; and in the better utilization of exhaust heat automobile manufacturers do not appear to be making any serious endeavors.

A possibility which does not seem to have been as carefully or closely considered as it justifies is that mentioned by Ricardo in connection with his super-charging experiments, viz., the cooling of a portion of the exhaust gases and their introduction into the cylinder with each fresh charge of mixture.

**T**HE report of the Steel Research Committee, formed jointly by the Society of Motor Manufacturers and the Institution of Automobile Engineers, which was issued in October, 1920, still holds good in respect to the ten standardized steels recommended for adoption by British automobile designers. These steels comprise two main groups, the first including two carbon steels differing in carbon content, a 2 per cent nickel steel and a 5 per cent nickel steel, all of which are primarily intended to be used for case-hardened parts; the second group consists



of one plain nickel and two carbon steels and three different types of nickel chromium steel (one of the air-hardening type) which are intended to be used ordinarily either as normalized or after some form of hardening with or without subsequent tempering.

A member of the Committee (Mr. J. H. S. Dickenson) read a paper before the I. A. E. in November, 1920, on the subject of these ten steels in order to assist users to determine and compare the mechanical properties of the materials, to judge their possibilities and limitations under various conditions of treatment and to obtain by selection of material and suitable heat treatment the most advantageous combination of the properties sought in each case.

**R**ECOMMENDATIONS of a similar nature to those just mentioned appear desirable in connection with aluminum and light alloys generally, for, though such matters as hardening and tempering do not enter into consideration, the selection of suitable light alloys for various purposes appears at present to be too haphazard, too dependent upon the imagination or crudely based ideas of the individual—that is, assuming, as more often is the case than not, that the individual concerned is not a member of the industry's research association or has not the facilities thus implied.

Experiments are proceeding in one or two quarters in regard to the more extensive use of light alloys in chassis construction, and the results may possibly be seen in chassis planned for production in 1923. But there is not much scope for extension. As material for back axle centers an aluminum alloy is quite ordinary, and there are already several British small cars said to have "all-aluminum" axle casings, though the description is not literally correct in view of the use of steel liners extended to support the wheel bearings. Aluminum cylinders with steel or cast-iron liners have also ceased to be noteworthy, and the same can, of course, be said in relation to aluminum pistons, water pumps, water pipes and other engine details, as well as clutch cones, and gearset casings.

But it has been suggested that there is scope for light alloys for hubs, rims and wheels; even aluminum or Duralumin frames, front axles and engine connecting rods have been proposed, but it is believed that no practical tests have been made of the use of light alloys for these parts, and it appears doubtful whether much, if any, weight would be saved if known alloys were utilized for such items, with design and dimensions rendering them capable of withstanding the stresses that would be imposed upon them.

The use of aluminum with air-cooling is believed to contain greater possibilities on account of its better heat conductivity as compared with cast-iron; but we have no example yet in automobile practice of cast-iron or steel liners in finned aluminum sleeves following occasional aero practice. But cast-iron finned cylinders with separate aluminum heads are being tried with seeming success on air-cooled cylinders.

Original research in connection with air-cooling has not proceeded far since the publication in AUTOMOTIVE INDUSTRIES of Dr. Gibson's paper, read before the I. A. E. in the session of 1920-21. Except in one or two

directions it is difficult to hear of any impending development in automobile engine design as a result of the research carried out by that investigator. The exceptions are concerned with air-cum-oil cooling on the lines referred to by the present writer in AUTOMOTIVE INDUSTRIES of April 20th last. Although definite information received on this matter may not be divulged, having been imparted in confidence, it can be said that research and experiments relating to the principle of utilizing the crankcase lubricating oil for cooling the cylinders and pistons are proceeding apace and notable developments are probable.

One problem which had to be solved is how far the oil should be used for extracting the heat from points of high temperature and to what extent direct air-cooling should be depended upon. So far as investigations have proceeded at present it would appear that, contrary to first ideas on this point, it is neither needful nor desirable to carry the oil around the exhaust valve seating and port, and it will possibly be found that an overhead exhaust valve and a side inlet will give best results in ordinary use, and tend still further to keep down the temperature of the large volume of oil which is carried in the crankcase and circulated rapidly in these "oil-cooled" engines.

Research and development in connection with motor buses appear to be confined at the moment to ways and means of reducing operating costs, mainly by the improvement of vaporizing systems with gasoline as fuel and by applying, as far as possible, approved production methods to repairs and overhauling.

A great advance has recently occurred in the overhaul and maintenance departments of the London Bus Co. By improved organization no more than three or four days are occupied where

previously two or three weeks were required to carry through a complete overhaul of chassis and body, including touching up and revarnishing the latter. It is not so much a matter of the direct costs of overhauling, though marked advantages are seen in this way; the important point is that buses are not kept idle for such a long while, which enables a greater proportion of the fleet to be in service at any one time—thus reducing capital charges.

**N**O avenue which might possibly lead to an improvement of a mile or two, or even far less, per gallon is being left unexplored, though no tangible results have become apparent of late. With a view, no doubt, to encouraging the imaginative and inducing those with ideas to come forward, an official of the London General Omnibus Co. recently expressed the view in a published interview that "a fortune" awaited the individual who could suggest a reasonable scheme whereby operating costs could be reduced, by improved fuel consumption, to the extent of one or two cents per mile.

This company, by the way, has not overlooked the possibilities of developments in air and oil cooling rendering this system feasible for buses and is known to be interesting itself in oil-cooling systems exemplified by those described in AUTOMOTIVE INDUSTRIES of April 20th last. The opening which oil-cooling may be found to provide leading towards a higher practicable m. e. p., better vaporization, and economy in oil and fuel consumption must obviously be attractive to bus operating companies.

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Even if water jackets are retained for the cylinder head and valve pockets there is the possibility of securing advantage in some of the named directions, as well as in others, by circulating a far larger volume of oil than now and arranging that it shall effectually extract heat from the cylinder walls and pistons.

In London services the 54-seated double-decker, known as the S type and described in detail in AUTOMOTIVE INDUSTRIES last year, appears likely to hold the field for awhile and it is unlikely that it will be superseded in the near future by a type with larger seating capacity. For provincial work and country services the single-decker with a seating capacity of 28 to 36 is also likely to remain the predominant type, but in view of its stuffiness in hot weather experiments are being made with a sliding roof and with a roof of the roller shutter pattern, though the difficulty so far has been to keep them waterproof after vibration, rain and sunlight have had their varying effects.

There are no signs of research or experiments having marked effect immediately or in the near future upon bus chassis design, with the possible exception that, as a result of the experience of the London Companies with the semi "over-type" (driver partly alongside and partly over the engine) this relative arrangement of engine and driving seat may be extensively adopted for provincial single-deckers, because of the additional passenger space it affords without increasing the wheelbase. It may here be mentioned that by far the biggest operating company outside of London (the Midland Bus Co.) runs gasoline-electric chassis exclusively and has no present intention of superseding this type.

#### Highway Transport

THE most important pending developments in connection with the transport of merchandise by road are (1) the probable entry of the railway companies into this field on a large scale and (2) the better organization of the clearing-house system among road transport undertakings to ensure certainty of return loads on inter-city trips. With regard to the former, the Bill which is now before Parliament authorizing the railways to organize road transport—either to supplement the railroads or independently of the latter—has been modified appreciably since it was first drafted owing to the opposition it originally encountered.

For the protection of truck makers and to conciliate the latter, a clause has been inserted with a view to preventing the railway companies from entering the manufacturing field, which was originally a possibility that caused the truck makers to be strenuous opponents of the Bill as a whole. Then, in an endeavor to cut the ground from under the feet of the road transport undertakings and allied interests, who protested that the rail-

ways wanted to run motor road transport merely to cut rates outrageously for awhile, secure a monopoly in road haulage and then divert freight back to the rails, a clause has been added which ostensibly will prevent anything of the kind by compelling the railway companies to charge minimum rates set by a special tribunal after investigation of complaints, if any, by the haulage companies.

The railways have agreed to keep separate accounts relating to motor transport, so that they can, if called upon, show figures proving their ability to make a profit at rates which they may ask the tribunal to authorize. Although originally the likelihood of the Bill being passed was more or less remote, it now has a good chance of doing so owing to the modifications and additions mentioned and others designed to prevent any possible unfair competition.

#### Railways as Highway Transport Operators

THE entry of the railways into the road transport business on a big scale should give a fillip to the truck industry, for while the companies now have fleets which they use for local deliveries they will obviously require large numbers of additional chassis for inter-city work and for transport over areas not now fed by the railroads. It is unlikely that they will confine themselves to one make of chassis, and doubtful whether they will specialize in British-made trucks. There may be an opening, therefore, for American truck makers.

Providing rates are not cut unreasonably, there is no valid reason why properly organized road transport undertakings pure and simple should not compete successfully with the railway companies for road traffic. But at present the majority are not properly organized by any means; there is a vast amount of waste of effort, time and money now going on, which necessarily has the effect of preventing rates from being as low or profits as high as they might be otherwise.

If the entry of the railway companies into this field serves to compel the motor haulage undertakings to set their houses in order, and organize and co-operate, it will do good all around—to the truck industry, owners of merchandise, and the general public.

The organization of the clearing-house system on a national basis will probably be the first outcome, and there is plenty of scope for development here; the sporadic and private efforts to provide return loads for trucks making inter-city journeys up to 150-200 miles in length have not been an unqualified success from several points of view. The railway companies will assuredly be able to avoid running their road vehicles empty or partially loaded on return trips, and the private enterprises will have to be placed, or place themselves, in a similar position if they are to live.

### French Subsidized Motor Lines

ABOUT fourteen years ago, in France, the state was authorized to grant subsidies for country services of motor cars, and at the present moment the subsidies amount to nearly 6,000,000 francs annually for 119 services. A great many other lines are running without state aid, owing to the refusal of the proprietors to accept the conditions imposed, requiring that the vehicles should make a double journey each day and that the service should be completed with a 2-ton truck. It is now proposed to modify the conditions, and a bill is being introduced whereby the amount of subsidy will be adjusted to the character of the service.

In the preamble to the bill reference is made to the tendency to abandon local railways where the traffic is not sufficient to cover working expenses, and it is urged that these lines should be made the most of with the aid of gasoline rail cars, which could be run much more cheaply and are more adaptable to light traffic.

It is urged that as much as possible should be made of the local lines so as to relieve the roads, and that the motor car services should be regarded merely as an extension of the railway system and for reaching the most out-of-the-way villages. It is for this purpose that the motor car service is considered best suited.



# Influence of Sales and Service Departments on Ignition Design

Correlation of ideas necessary to satisfactory design. Sales, service, engineering and production departments all have different sense of values. Design can give favorable appearance without sacrificing performance qualities

By A. H. Packer

**W**HEN a concern manufacturing automotive electrical equipment undertakes to design ignition apparatus, the exact type produced is naturally a compromise between the different points of view taken by the different departments. The concern is naturally interested in putting out a product which will enable it to pay dividends, so the ability to sell and make money on the article under consideration is of first importance. The best possible design in the world would be of no value from this standpoint if its appearance were such that it could not be sold. For this reason the sales department will naturally wish to present something which has a pleasing and symmetrical appearance and, if possible, incorporates unique features in design and construction. These will provide this department with talking points which can be used both in advertising and in personally presenting the product.

Members of the engineering department, on the other hand, while appreciating the value of the appearance of the equipment, will naturally be in favor of developing an outfit which is a credit to the skill and training they reflect. They will, therefore, appreciate the incorporation of unique electrical or mechanical features and will also wish to make the outfit superior in performance, if possible, to other similar equipment on the market. They will, therefore, have in mind the development of high voltage which will give a spark capable of jumping a long distance and will also seek to have this spark of maximum possible intensity or heat value. It will also be the endeavor of the engineering department, in case an automatic advance is contemplated, to have this operate as nearly as possible in accordance with the spark advance requirements of engines for which the outfit is being designed. The practical details of construction in the layout of spark advance, methods of assembly and facility for manufacturing will also be foremost in the attention of the engineering department.

During the process of negotiation the service department will usually be called in to see that the outfit is properly installed and that the operation is satisfactory to those in charge of the test for the prospective customers. From an application standpoint, the service department will then be interested in the facility with which the device can be timed; also the facility with which points can be adjusted and the possibility of the device being so constructed that a change from four to six or eight cylinders is not a serious matter, this being accomplished by changing the cam and distributor cap

or something of this kind. Under such circumstances an engineer negotiating with a concern making a four-cylinder car could, by replacing, say, two parts, adapt sample equipment so that he could immediately go to another negotiation requiring six or eight cylinder samples. The service department will also be interested in the facility with which an ignition outfit can be adapted for either direction of rotation, for in addition to the possibility of a mistake in specifications there is always the chance that while negotiating with a concern requiring one rotation there may be received a telegram to get in touch with some other concern requiring the reversed rotation.

After the device in question has been on the market for some time and has been sold to a number of concerns, the service department will further be interested in the manner in which it gives satisfaction. Here the durability of the interrupter will have to be considered, both in regard to the way it stands the rapid mechanical vibration and the durability of the contacts as to whether they tend to come loose from the parts to which they are riveted and as to whether they develop electrical trouble and burning of the surface due to improper coordination of the electrical requirements and the ability of the contacts to handle the primary current.

The service department will also be vitally concerned with the design of the coil, and as all engineering is more or less a matter of compromise, they will tend to favor a coil which will be somewhat weaker in initial performance and where the intensity of spark may have been sacrificed somewhat for the purpose of strengthening the insulation so that the possibility of shorted coils may be reduced to a minimum. In the same way the service department will favor a condenser which is big enough so that it may not only have the required capacity but may have sufficient layers of paper between sheets of tinfoil so as to reduce danger of puncture as much as possible. The durability of the outfit in service will also depend on the efficiency of the lubrication.

In the case of the use of automatic advance the service department will be interested more in the general nature of its operation than its theoretical coincidence with the timing requirements of the engine. This will mean that its freedom of action and ability to return immediately with reduction in speed will be of vital importance, and here proper design and suitable lubrication will bear an important part. The design will also be of interest to the service man in regard to the way in which variation

in interrupter gaps affects timing of the device when installed on the engine, as this varies considerably with different types of cams. Freedom from missing will also be facilitated by the use of a flexible copper shunt connecting the ignition unit to the engine so that trouble will not be experienced due to the insulating qualities of the lubricating oil used where the ignition outfit is mounted in the engine.

The service department will also be interested in the degree in which the fiber bumper wears away, due to the rubbing action of the cam, as this will tend to close up the interrupter points, whereas if the points burned considerably the gap might gradually increase. A theoretically ideal condition would be such that the burning away of the interrupter points would be exactly compensated for by the wear on the fiber bumper. This is rarely encountered in practice, however, the usual condition being that the points gradually close up, due to fiber wear.

The design of the ignition outfit will also considerably affect the ease or difficulty with which new contacts and parts can be installed. Two general types are in use, one in which the assembly is mounted on a flat plate, which insures the maximum accessibility, the other with the interrupter parts mounted in a cup-shaped casting, which usually does not provide such accessibility. This, however, is not quite the case where the interrupter parts are mounted on a plate set in the bottom of the casting, which can easily be removed and replaced in its entirety.

The points of view of the various departments, as above indicated, have been tabulated below, these various percentage estimates being the writers' personal opinion, and, of course, each reader will have his own idea of the exact value placed on these various qualities by the different departments, but it will, no doubt, be admitted that the general nature of the analysis is substantially correct.

	Sales Dept. Per cent	Engineering Dept. Per cent	Service Dept. Per cent
Appearance .....	50	18	5
Performance .....	30	50	10
Application .....	10	15	10
Service performance..	8	15	40
Parts accessibility....	2	2	35

The view of the engineer for the automobile manufacturer contemplating the use of some ignition outfit, very often is likely to coincide with the view taken by the engineering department doing the designing so that he may place too much importance upon the initial performance and not enough on features of design which are hard to see and determine, but which eventually affect the satisfaction the outfit gives. The question of heat of spark comes up for prominent consideration, especially in view of the acknowledged fact that present day fuel vaporizes with difficulty, but whether additional heat beyond a certain amount will aid in firing the fuel after it has been vaporized is quite a different question.

For the sake of a home-made illustration we might consider lighting a bonfire with a match and see if the use of two matches at the same time and in the same

place would be an appreciable advantage in rapidly spreading the flame through the combustible material. Under these circumstances there would apparently be no improvement. As to whether this illustration applies to the combustion chamber of a gasoline engine, research alone can determine, but the writer has during the last two winters had the opportunity of using on a Ford car an ignition coil which for heat of spark might not compare strongly with other ignition systems, yet this engine in a cold garage would invariably start after two revolutions of the flywheel. The Ford had standard manifold with no heater and nothing to aid starting but the regulation choker. It is accordingly the writer's opinion that excessive heat of spark would accomplish little, and that the main difficulty is in the driver's inability to control the gas mixture properly, either not choking the carburetor enough or else using the choker too much and flooding the engine.

In observing a spark it is seen to consist of a thin white or blue streak through the center surrounded by more or less reddish haze or flame, the volume of which is indicative of the amount of heat or amperage in the spark. If we now consider that this reddish flame when

in the cylinder consists of a sphere of heat which in one case may be 1/16 in. in diameter and in another 3/32 or 1/8 in., it would appear that the start that we have given the flame is rather slight when compared to the distance it must travel from the spark plug to the farthest recess of the firing chamber. Assuming, then, that the smaller spark will fire the gap under the worst conditions, it would seem that an increase in the spark would be obtained merely at the expense of reduction in insulation, and, consequently,

in the life of the ignition coil. The service department will, consequently, be in favor of constructing a coil in which space for the copper wire is sacrificed for the use of possibly three layers of insulating paper in place of two, and while this coil will not make as spectacular a test it will unquestionably stand up in service and give more ultimate satisfaction to the car user and therefore to the factory using such equipment.

In the design of the condenser the service man's point of view will also favor a liberal design to eliminate, if possible or at least reduce to a minimum, the possibility of punctures. Here the use of an additional sheet of paper in between the layers of tinfoil will reduce the capacity of the condenser, and hence its ability to absorb the arc at the contact, and in order to regain this loss in capacity it will be necessary to make the condenser larger, so as to get a greater area of surface.

Here, too, general designs must be considered. Two locations are commonly used. The condenser is either mounted in the coil or built into the interrupter. The mounting of the condenser in the interrupter has the obvious advantage that it is close to the points and consequently requires no outside connections. In this location, however, it is somewhat limited by lack of space, and the temptation will be to reduce the number of layers of insulating paper so that a condenser of the proper capacity can be put into the space available. This practice, while favoring the standpoint of the sales department for compact and neat appearance, may ultimately react in unfavorable operating characteristics.

**H**OW much importance does the sales department attach to service performance in the design of ignition apparatus? The writer thinks that the interest of the sales department in design is divided as follows:

Appearance, 50 per cent.

Performance, 30 per cent.

Application, 10 per cent.

Service Performance, 8 per cent.

Parts Accessibility, 2 per cent.

The article also analyzes the emphasis given to these various factors by the other departments.



The location of the condenser with the coil usually has the advantage that more space is available and the disadvantage that the inductance of the leads between the condenser and the interrupter tends to neutralize its ability to absorb the arc. This can be compensated for, however, by making the leads between the coil and interrupter as short as possible and by slightly increasing the size of the condenser. However, with the usual design of coil, in which the coil and condenser are surrounded with a compound of some sort, it is necessary to install a new coil whenever the condenser becomes defective, this being a rather serious disadvantage from the user's standpoint. In more recently designed coils, however, the use of the compound has been eliminated and the coil so constructed that it can be easily taken apart and a new condenser inserted. This construction is the best from the standpoint of the service department.

It is often observed that an automobile manufacturer employs one type of electrical equipment one year, manifesting much enthusiasm over its installation, but later in the year cools off somewhat as reports of various troubles start to come in, and a year later he turns to some other type of equipment. It is quite possible that this is due to the fact that the engineer for the automobile concern, while expert on the design of the chassis, engine, etc., is not as familiar with electrical principles as he should be and naturally judges the

value of a device by its operating characteristics as brought out by the initial test. It is a well known fact that all engineering is more or less a matter of compromise and that no amount of cleverness will change fundamental engineering facts, so that if the various possibilities of ignition devices were frankly discussed between the representatives of the electrical concern and of the prospective purchaser it would no doubt result in more all-around satisfaction.

Up to this time the standpoint of the man in charge of production has been purposely omitted, but his attitude will be much the same as that of the service department in regard to ease of assembly, etc. In the matter of making the individual parts, however, he may have some ideas as to change in design to facilitate manufacture, and while all concerned should co-operate to reduce cost of production, care must be used to see that some change in design or material is not made that would detrimentally affect the performance or operating characteristics after the device had been placed in regular service.

The final word in regard to points in design should be left to a sales engineer having the authority of an officer in the company, who should possess the engineering ability and broad business experience to enable him to accurately weigh the points presented by the different departments.

## Advertising Can Bring Government and Business Together

**F**OLLOW the "sign post" of sound advertising if you are seeking the highway of business success is the advice of F. M. Feiker, formerly personal assistant to Secretary of Commerce Hoover, and now special representative of the Department of Commerce.

Speaking at the First National Industrial Advertising Conference of the Associated Advertising Clubs of the World in Milwaukee, Mr. Feiker declared that his suggestion applies to government as well as business. He said: "Advertising can bring government and business together, because advertising brings business and the public together, and the government's relation to business is after all simply the public's relation to business."

The Commerce Department is a "regular treasure cave" of copy ideas. Every advertising man in a manufacturing establishment, every head of a copy plan board, should take a little box of note books and go to Washington for new ideas, in Mr. Feiker's opinion. He said that the whole program for a better understanding of statistics in industry, the advancement of our foreign trade and its long-time and vital relation to our domestic trade, the elimination of millions of dollars of industrial waste through simplified practice, all are full of copy ideas for advertising both in the field of industrial advertising and in the field of general advertising.

"If twenty of our largest advertisers would approach their business from the point of view of eliminating waste along the line of simplifying sizes and eliminating excess varieties and then advertise their programs of simplification to the buying public, one of the greatest forces for public education and more intelligent buying would be started. And more intelligent buying will make possible more regular production, cut out seasonal variation and unemployment."

"Let industry police itself," is the new policy of the Department of Commerce in the opinion of Mr. Feiker. In carrying out this policy over one hundred and fifty

foreign trade committees from different business associations are working through fifteen or twenty special commodity experts of the Department of Commerce in the extension of foreign trade in different fields of activity, and as a result of this helpful service to industry the inquiries from business men per day at the Department have jumped from two or three hundred to over one thousand.

He referred to the accomplishments of the new Division of Simplified Practice, established less than a year ago as part of the Bureau of Standards. "This Division does not tell industry what it must do to be saved, but reverses the operation and acts as a center point to which committees of industry representing all branches, buyers and sellers and specifiers, may come to discuss the opportunity for the simplification of dimensions and the elimination of excess varieties." He added that after less than a year's work this division has already concrete evidence of accomplishment. The paving brick manufacturers have reduced the number of paving bricks by mutual consent between themselves and their buyers from 66 to 5. The metal beds, wooden beds, and spring and mattress manufacturers meeting together at the Department decided on a few standard sizes instead of scores and odd sizes. "This squeezing the waste out of industry by way of industry is proceeding along many other lines with excellent results assured."

**C**ONSUL LEE, at Porto Alegre, reports that there are about 360 tractors in Brazil, ten of the track-laying type and 350 wheel type. Most of these tractors were received at the ports of Rio de Janeiro, Santos and Porto Alegre and very few were imported into the northern parts of Brazil. The state of Rio Grande do Sul has 143 tractors, all but three being of the wheel type. No figures are available at present showing the distribution of these tractors throughout the other states of Brazil.

# New S. A. E. Standards Report of Interest to Many Manufacturers

Recommendations covering bumper mountings, oil drain plugs, spring steel, truck axle parts, electrical equipment, tractor drawbar adjustment, bronze and aluminum sheet, bearing metals, ball studs, screw threads and serrated fittings are important to vehicle as well as to parts makers.

**S**TANDARDIZATION furnishes no thrills. It's just common sense boiled down and made available for the mutual benefit of manufacturers and users. That standards work is of great importance to the automotive industry has long been evident to all who are not blind, and the recent work of the Standards Committee of the Society of Automotive Engineers is no exception to this rule. The semi-annual report of this Committee is to be presented at the Summer Meeting of the Society to be held at White Sulphur Springs, W. Va., June 20 to 24. The report contains many items which are or should be of great interest to nearly all automotive manufacturers, whether they build complete vehicles, parts or equipment. The meeting affords an opportunity to discuss the recommendations which should not be overlooked.

Among the more important recommendations may be mentioned that covering bumper mounting. This, of course, avoids patented methods of attachment. It involves a standard punching or drilling of the front horn of frame members, making it possible to readily attach the bumper or a bracket to carry it without further drilling. It should prove a boon to bumper makers, as well as to car manufacturers, a large percentage of whom are said to be willing to follow the standard if it is adopted.

Another important recommendation is that of the Engine Division, providing for the use of an oil drain plug with a minimum opening of  $\frac{3}{4}$  in. to be located at the lowest point of the oil pan and operable from the engine hood. This will facilitate the draining of old oil from the crankcase and flushing out the latter—an operation which is now frequently neglected because of the relative inaccessibility and small size of drain openings, with consequent more rapid deterioration of the engine through the use of dirty or fuel-diluted lubricant.

The proposal of the Iron and Steel Division, covering specifications for rolling tolerances for concave spring steel will facilitate both the manufacture and purchase of such steel and influence its suitability for conversion into leaf springs.

Many of the standards thus far adopted by the Society have a decided influence in the way of facilitating service operations as well as convenience in the manufacture of parts. The recommendation for a standard hexagon head for breaker contacts and check nuts is in this class. If this recommendation is approved and followed by manufacturers, it will eliminate the need for special wrenches now frequently required in ignition repair work.

The Axle and Wheels Division is recommending the extension of certain standards already adopted covering dimensions for motor truck front axle spindles. The pro-

posals include standard dimensions for the threaded spindle end, including size and length of thread, diameter and location of cotter pin hole, and width of groove at back end of the thread.

One of the most important standards relating to isolated plant lighting equipment ever adopted is that providing for standard magneto mountings for engines in this class. Heretofore, there has never been any standard for such mountings, and the probable adoption at the coming meeting of the proposed recommendation will be of great advantage both to manufacturers of isolated electric plants and to magneto manufacturers.

Several new specifications for non-ferrous metals are proposed by the Non-Ferrous Metals Division. These include phosphor bronze strips for flat springs, aluminum sheet and strip of varying temper, brass wire for brazing, annealed copper wire and several additional specifications for bearing metals.

The Parts and Fittings Division, which has from time to time been concerned with the preparation of standard specifications for numerous miscellaneous parts and fittings, is again submitting an extensive report on a number of items of considerable importance. These include the bumper mounting specifications already referred to, and extension of the existing standard for adjustable yokes, providing for a light and heavy series, a table of specifications for plain steel washers for bolt diameters of from  $\frac{1}{4}$  to  $1\frac{1}{2}$ -in., a table of specifications for ball studs of nominal diameter varying from  $\frac{1}{2}$  to 3 in., and a table of specifications for straight and tapered serrated shaft fittings.

This work, thus briefly summarized in a paragraph, has required many months for its completion. It has involved the preparation of questionnaires sent to the various and numerous manufacturers interested in production of the parts involved, the digesting and reconciling of views held by the various manufacturers, and the preparation of tabular matter covering the controlling dimensions of the parts standardized. For example, a questionnaire sent to some 75 companies was the basis of the recommendation in connection with serrated shaft fittings. Most of these companies submitted data which indicated that these fittings are extensively used and should be standardized. The recommendations covering ball studs involved a revision of similar specifications submitted by the Division at the last summer meeting of the Society.

Perhaps no standards are more important or more extensively used throughout the automotive and related industries than those referring to screw threads. The sub-



ject, therefore, merits careful study and has received consideration by numerous committees. During the war, the National Screw Thread Commission was created by act of Congress. It has since made extensive and important recommendations in reference to screw threads. This Commission includes in its membership two members nominated by the Society, and is, consequently, in close touch with the S.A.E. Standards Committee. The Screw Threads Division has been reviewing portions of the Screw Thread Commission's work which are of interest to the automotive industry, and has recommended the adoption, as an S.A.E. standard, of certain tables prepared by the Commission and covering sizes, tolerances, allowances, etc., for screw threads of medium fit and free fit. The Division also makes some minor recommendations in reference to present S.A.E. standard bolts, cotter pin locations, etc.

In the following pages are printed, practically in full, the detail recommendations of the various divisions scheduled to present reports at the S.A.E. summer meeting.

The Axle and Wheels Division recommends that the accompanying tables be approved for adoption as an extension of the present S.A.E. recommended practice for motor truck front axle hubs.

#### Dimensions of Motor Truck Front Axle Spindle Ends

Spindle No.	5	6	7	8	9
Thread, U.S.S.	1 $\frac{1}{8}$ -7	1 $\frac{1}{8}$ -7	1 $\frac{1}{2}$ -6	1 $\frac{1}{2}$ -6	1 $\frac{1}{2}$ -6
Length of threaded end	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$
Height from center line of spindle to flat milled on threaded end	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
Center of cotter-pin hole to end of thread	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
Diam. of cotter-pin hole	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{7}{16}$
Width of groove at back end of thread	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$

#### General Information for Motor Truck Front Axle Hubs

Spindle No.	5	6	7	8	9
Spindle load rating in lb. on solid tire at ground	1250	1625	2125	2750	3500
Solid tire size	34x3 $\frac{1}{2}$	36x4	36x5	36x6	36x7
Solid tire load rating, lb.	1300	1700	2500	3300	4200

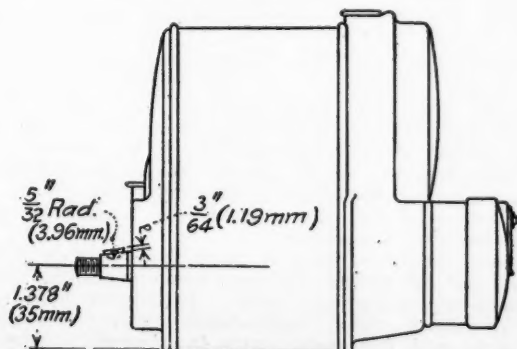
The Electrical Equipment Division makes the following recommendations: That the present S.A.E. standard for ignition distributor mountings be revised by

- (1) Specifying a dimension of 27/32 in. for the distance from the bottom of the distributor mounting barrel to the bottom of the tongue on the distributor half of the driving coupling of the Type B ignition distributor.
- (2) Changing the limits for the bore in the coupling from 0.4930 in. maximum and 0.4920 in. minimum to 0.4915 in. maximum and 0.4905 in. minimum.

That the magneto dimensions given in the accompanying illustration be given as S.A.E. recommended practice, as an addition to the present S.A.E. standard for magneto mountings.

That the hexagon head of breaker contacts and check nuts shall be  $\frac{1}{4}$  in. across flats and that the threads shall be No. 10-40 or No. 8-40.

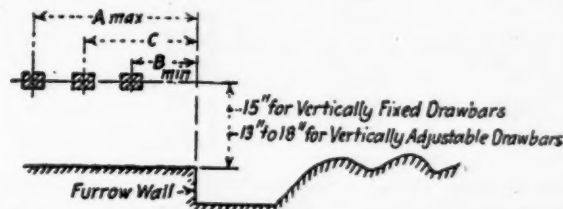
That the diameter of the bolt holes for sizes Nos. 1 and 2 of the S.A.E. standard for starting motor flange mountings be changed from 7/16 to 13/32 in.



The Agricultural Power Equipment Division recommends that the present S.A.E. standard for tractor drawbar adjustments be revised to conform with the limits specified in the accompanying table:

#### Tractor Drawbar Adjustments

Plow	Two-bottom		Three-bottom		Four-bottom	
	12-In.	14-In.	12-In.	14-In.	12-In.	14-In.
A—Max.	30	30	30	32	35	40
B—Min.	13	15	18	20	22	24
C—Best average	17	20	22	26	27	32



- A—Maximum hitching position from the furrow wall, very often necessary when the tractor operates on the land.  
B—Minimum hitching position from the furrow wall when the tractor operates in the furrow.  
C—Best average hitching position from the furrow wall.

The Engine Division recommends for S. A. E. recommended practice that crankcase drain plugs shall have a minimum opening of  $\frac{3}{4}$  in., be located at the lowest point of the oil pan and be operable from under the engine hood.

The Iron and Steel Division recommends the adoption of the accompanying specification for leaf spring steel tolerances as S.A.E. recommended practice.

#### Rolling Tolerances for Concave Spring Steel

The finished bars shall be of double concave section with round edges. The radii of the arcs of the two concave surfaces shall be of equal length.

Rolls to produce the round edges shall be turned to a radius equal to two-thirds the thickness of the bar.

All bars ordered to gage shall be rolled to the Birmingham wire gage.

All bars must meet the width and thickness tolerances specified in the following table:

#### Width and Thickness Tolerances

Width of Flat, in.	To, Inclusive	Width, in.		Thickness, in.	
		Plus	Minus	Plus	Minus
Over 0	2 $\frac{1}{4}$	1/32	0	0.005	0.005
2 $\frac{1}{4}$	3	3/64	0	0.006	0.006
3	5	1/16	0	0.007	0.007

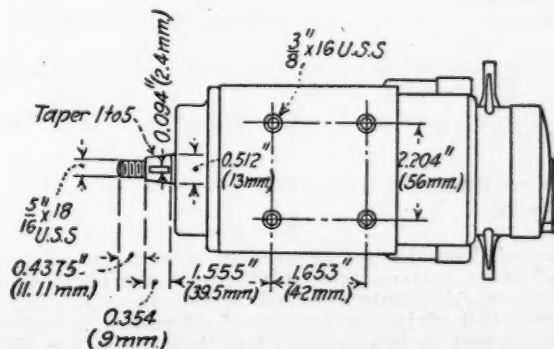
\*Thickness measurement to be taken at edge of bar where concave surface intersects round edge.

The difference in thickness between the two edges of each bar shall not be greater than those given in the following table:

#### Differences in Thickness

Width of Flat, in.	To, Inclusive	Difference in Thickness, in.
Over 0	2	0.002
2	3	0.003
3	5	0.004

Spring steel bars shall not have more than 1 in. curvature in 20 ft., or 1 $\frac{1}{4}$  in. in 25 ft., or 1 $\frac{1}{2}$  in. in 30 ft.



The concavity, or difference between the thickness at the edges and at the center of the bar, shall be as specified in the following table:

Allowable Variations in Concavity			
Width, in.	Nominal Concavity, in.	Maximum Concavity, in.	Minimum Concavity, in.
1½	0.007	0.009	0.004
1¾	0.008	0.010	0.005
2	0.010	0.012	0.006
2¼	0.011	0.013	0.007
2½	0.013	0.015	0.009
3	0.016	0.018	0.012
3½	0.018	0.020	0.013
4	0.021	0.023	0.016
5	0.029	0.031	0.023

The Lighting Division recommends that the present S. A. E. recommended practice for head lamps be revised as indicated below:

- (1) Change the second sentence in the paragraph under the sub-heading "Mounting," which now reads, "Means for adjusting the head lamps shall be provided so as to permit a change in the vertical as well as in the horizontal angle of the head lamps, \* \* \*" to read "For adjustable types of head lamp mountings means shall be provided, \* \* \*"
- (2) Under the sub-heading "Brackets" insert the following: "Adjustable Type.—The adjustable type of mounting bracket for head lamps mounted on fenders, radiator shells, frame pillars, tie rods and similar constructions, is recommended."

The Lighting Division also recommends:

That the G10, G12 and G16½ lamps be omitted from the S.A.E. standard for electric incandescent lamps.

That the present S.A.E. standard for electric incandescent lamp voltages be revised by omitting the 8 to 10 and the 18 to 24 voltage ranges and the reference to four and nine battery cell arrangements.

That the following report be adopted as S.A.E. recommended practice:

- (1) For motorboats and small cruisers having combined starting and lighting equipment, it is recommended that nominal 6-volt (6 to 8 volts) or nominal 12-volt (12 to 16 volts) systems be used.
- (2) For larger cruisers having separate lighting equipment, it is recommended that the 32 or 110-volt system be used.

### Non-Ferrous Metal Specifications

The Non-Ferrous Metals Division recommends that Specifications Nos. 77, 78, 82 and 83 be adopted as S.A.E. standard.

#### Specification No. 77, Phosphor Bronze Strip for Flat Springs

This specification covers bronze strips up to 0.080 in. gage for flat springs and includes a variety of tempers in two alloys, from which a suitable quality can be chosen for any ordinary purpose.

Composition in percentage:

	Grade A	Grade B
Tin	4.00 to 6.00	7.00 to 9.00
Phosphorus	0.03 to 0.40	0.03 to 0.20
Zinc, max.	0.20	0.20
Iron, max.	0.10	0.10
Lead, max.	0.10	0.10
Copper	Remainder	Remainder

**Temper Designation.**—The temper of strip phosphor bronze shall be designated as follows:

Temper	Reduction, B. & S., Nos.
Half Hard	2
Hard	4
Extra Hard	6
Spring	8

**Physical Properties.**—The average tension test of two samples of sheet thinner than 0.080 in. should conform to the minimum requirements specified in the accompanying table.

In very thin strips, on account of difficulties in testing, the elongation may be considerably less than the values given.

### Minimum Physical Properties

Temper	GRADE A		GRADE B	
	Minimum Tensile Strength, Lb. Per Sq. In.	Minimum Elongation in 2 In., Per Cent	Minimum Tensile Strength, Lb. Per Sq. In.	Minimum Elongation in 2 In., Per Cent
Half Hard.....	55,000	15.0	65,000	20.0
Hard.....	75,000	5.0	85,000	7.5
Extra Hard.....	85,000	2.0	100,000	1.0
Spring.....	90,000	1.0	.....	....

**Dimensional Tolerances.**—The width of the strip shall not vary more than 0.01 in. from the size specified in the order.

**General Information.**—These should be considered as general specifications. Phosphor bronze strip is used for various kinds of springs where the manufacturing requirements and the uses to which the springs are put are too particular to be specified by ordinary physical tests. It is advisable to submit samples or drawings to the manufacturer and secure an adjustment of temper to suit the manufacturing and service requirements of the article.

Flat springs formed with easy bends across the grain are usually made of the Grade A alloy, "Spring" temper.

Flat springs with easy bends either across or with the grain are usually made of the Grade B alloy, "Extra Hard" temper.

Clips or contact springs with most difficult bends are usually made of the Grade B alloy, "Hard" temper.

### Thickness Tolerances for Phosphor Bronze Strips

B. & S. Gage No.	Thickness		Width, In.			
	From To, Incl.	Decimal	Up to 5 Incl.	Over 5 to 8 Incl.	Over 8 to 11 Incl.	Over 11 to 14 Incl.
0000	0	0.4600	0.3248	0.0044	0.0048	0.0051
0	4	0.3248	0.2043	0.0039	0.0043	0.0046
4	8	0.2043	0.1284	0.0034	0.0038	0.0041
8	14	0.1284	0.0640	0.0029	0.0033	0.0036
14	18	0.0640	0.0403	0.0025	0.0029	0.0033
18	24	0.0403	0.0201	0.0020	0.0024	0.0028
24	28	0.0201	0.0126	0.0016	0.0020	0.0024
28	32	0.0126	0.0079	0.0013	0.0017	0.0020
32	35	0.0079	0.0056	0.0010	0.0014	0.0017
35	38	0.0056	0.0039	0.0008	0.0012	0.0015

All tolerances plus or minus.

### Specification No. 78, Aluminum Sheet and Strip

Composition in percentage:

Aluminum, min. 99.00

**Physical Properties.**—Aluminum sheet and strip are furnished in several tempers or degrees of hardness. The mechanical properties of aluminum sheet or strip conforming to Tempers, No. 1, Soft Annealed; No. 2, Half Hard, and No. 3, Hard, are given in Table 1.

The tension test specimen is taken parallel to the direction of cold rolling. Sheet or strip of Temper No. 1 should withstand being bent double in any direction and hammered flat. Sheet or strip of Temper No. 2 should withstand being bent around a pin of radius equal to the thickness of the sheet,

Table 1—Mechanical Properties for Tempers No. 1 to 3

Temper No.	B. & S. Gage No.		Thickness, In.		Minimum Tensile Strength, Lb. Per Sq. In.	Minimum Elongation in 2 In. Per Cent
			From	To, Incl.		
		From	To, Incl.			
1	12	16	0.0808	0.0509	12,500	30
1	17	22	0.0508	0.0227	12,500	20
1	23	26	0.0226	0.0159	12,500	10
2	12	16	0.0808	0.0509	18,000	7
2	17	22	0.0508	0.0227	18,000	5
2	23	26	0.0226	0.0159	18,000	5
3	12	16	0.0808	0.0509	22,000	4
3	17	22	0.0508	0.0227	25,000	2
3	23	26	0.0226	0.0159	30,000	2

without cracking. Sheet or strip of Temper No. 3 will not endure any considerable bending without cracking.

The usual variations in the thickness of sheet or strip are shown in Table 2.

**General Information.**—The specific gravity is about 2.70. Young's modulus of elasticity is about 10,000,000 lb. per sq. in.

Aluminum sheet and strip are used for many purposes where the requirements, either because of the service or the forming operations, are too specific to be covered in any general specification. It is usually advisable, therefore, to submit samples or drawings to the manufacturer to assist in the selection of the proper anneal or temper to suit the service or forming operations.

Aluminum sheet or strip is used for automobile bodies, hoods (special flat sheet), fenders, housing covers, floor covering, molding, instrument parts, instrument boards, hub-caps, wire wheel disks, brake-drum covers, miscellaneous pressed parts and for many parts in aircraft construction.



Table 2—Permissible Variations

B. & S. Gage No.		Thickness, In.		Permissible Variations, In.
From	To, Incl.	From	To, Incl.	
10	17	0.1019	0.0404	0.003
18	26	0.0403	0.0159	0.002

**Specification No. 82, Brass Wire for Brazing**

Composition in percentage:

Copper	59.00 to 62.00
Lead, max.	0.30
Iron, max.	0.06
Aluminum	None
Zinc	Remainder

This wire should be finished soft annealed. The surface should be clean and free from scale or other foreign materials.

**General Information.**—Wire in accordance with this specification is suitable for torch welding.

**Specification No. 83, Soft or Annealed Copper Wire**

**Composition.**—The copper shall be of such quality and purity that, when drawn and annealed, it shall have the properties and characteristics herein required.

**Shapes.**—These specifications cover untinned drawn and annealed round wire.

**Finish.**—The wire must be free from all imperfections not consistent with the best commercial practice.

Necessary brazes in soft or annealed wire must be made in accordance with the best commercial practice.

**Specific Gravity.**—For the purpose of calculating weights, cross-sections, and other purposes, the specific gravity of copper shall be taken as 8.89 at 20 deg. Cent. (68 deg. Fahr.).

**Dimensions and Permissible Variations.**—The size shall be expressed as the diameter of the wire in decimal fractions on an inch.

Wire shall conform to the following permissible variations in nominal diameter:

**Mechanical Requirements for Soft Copper Wire**

Diameter or Thickness, In.		Tensile Strength Lb. Per Sq. In.	Elongation in 10 In., Per Cent
Over	To, Incl.		
0.460	0.230	36,000	35
0.289	0.103	37,000	30
0.102	0.021	38,500	25
0.020	0.003	40,000	20

Wire 0.010 in. diameter and larger, 1 per cent over or under.

Wire less than 0.010 in. diameter, 0.1 mil (0.0001 in.) over or under.

**Mechanical Requirements.**—Wire shall be so drawn and annealed that its tensile strength and elongation shall not be greater nor less respectively than the values specified in the accompanying table. For wire whose nominal diameter is between the given sizes, the requirements shall be those of the next larger size included in the table.

Copper wire is usually purchased in B. & S. Gage.

**Electrical Resistivity.**—Electrical resistivity shall be determined upon fair samples by resistance measurements at a temperature of 20 deg. Cent. (68 deg. Fahr.), and it shall not exceed 891.58 lb. per mile-ohm.

**General Information.**—As soft or annealed copper wire is so soft and ductile that it is easily marred by careless handling in the operation of winding or cabling, all testing and inspection must be done at the manufacturer's plant.

**White Bearing Metals.**

The Non-Ferrous Metals Division recommends the adoption of the extended specifications for White Bearing Metals Nos. 10, 11, 12, 13 and 14.

**Specification No. 10, Babbitt**

When finished bronze-backed bearings are purchased a maximum of 0.6 per cent lead is permissible in scraped samples provided a lead-tin solder has been used in bonding the bronze and the babbitt.

Composition in percentage:

	No. 10 Cast Products	No. 10A Ingots
Tin	90 to 92	90.75 to 91.25
Copper	4 to 5	4.25 to 4.75
Antimony	4 to 5	4.25 to 4.75
Lead, max.	0.35	0.35
Iron, max.	0.08	0.08
Arsenic, max.	0.10	0.10
Bismuth, max.	0.08	0.08
Zinc and aluminum	None	None

**General Information.**—No. 10 babbitt is very fluid and may be used for bronze-backed bearings, particularly for thin linings such as are used in aircraft engines. It is also suitable for die castings.

**Specification No. 11, Babbitt**

Composition in percentage:

	No. 11 Cast Products	No. 11A Ingots
Tin	86.00 to 89.00	87.25 to 87.75
Copper	5.00 to 6.50	5.50 to 6.00
Antimony	6.00 to 7.50	6.50 to 7.00

**General Information.**—This is a rather hard babbitt which may be used for lining connecting-rod and shaft bearings which are subjected to heavy pressures; its "wiping" tendency is very slight. It is also suitable for die castings.

**Specification No. 12, Babbitt**

Composition in percentage:

	No. 12 Cast Products	No. 12A Ingots
Antimony	9.50 to 11.50	10.25 to 10.75
Copper	2.25 to 3.75	2.75 to 3.25
Lead	24.00 to 26.00	24.75 to 25.25

**General Information.**—This is a relatively cheap babbitt and is intended for bearings subjected to moderate pressures. It is also suitable for die castings.

**Specification No. 13, Babbitt**

Composition in percentage:

	No. 13 Cast Products	No. 13A Ingots
Tin	9.25 to 10.75	9.75 to 10.25
Antimony	14.00 to 16.00	14.75 to 15.25
Lead	74.00 to 76.00	74.75 to 75.25

**General Information.**—This is a cheap babbitt and serves successfully where the bearings are large and the service light. It should not be used as a substitute for a babbitt with a high tin content. It is also suitable for die castings.

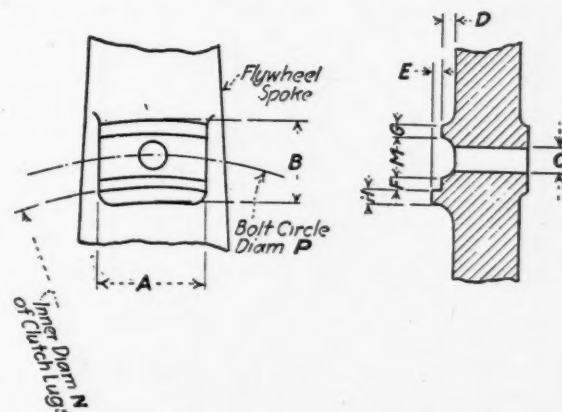
**Specification No. 14, Babbitt**

Composition in percentage:

	No. 14 Cast Products	No. 14A Ingots
Tin	9.25 to 10.75	9.75 to 10.25
Antimony	14.00 to 16.00	14.75 to 15.25
Lead	74.00 to 76.00	74.75 to 75.25

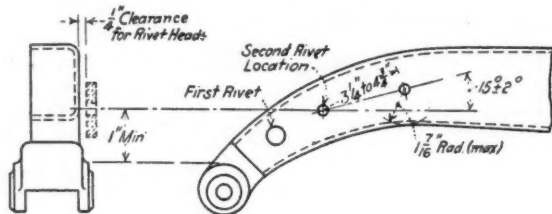
**General Information.**—This is a cheap babbitt and serves successfully where the bearings are large and the service light. It should not be used as a substitute for a babbitt with a high tin content. It is suitable for die castings.

The Stationary Engine Division recommends that the fly-wheel pulley lug dimensions given in the accompanying table be adopted as S.A.E. recommended practice.

**Pulley and Friction Clutch Fastening Lugs**

A	B	C	D	E	F	G	H	M	N	P	Number of Lugs to Pulley or Clutch
1 1/2	1 1/4	3/8	1/4	3/8	1/4	1/4	3/8	3/4	8 1/2	9 3/4	6
1 3/4	1 1/2	3/8	1/4	3/8	1/4	1/4	3/8	3/4	14	15 1/4	6
2	2 1/4	3/8	1/4	3/8	1/4	1/4	3/8	1 1/4	16 1/4	17 3/4	6
2 1/4	2 1/2	3/8	1/4	3/8	1/4	1/4	3/8	1 1/2	18 1/4	19 3/4	6

The Parts and Fittings Division recommends that the passenger car front bumper mounting shown in the accompanying illustration be adopted as an extension of the present S.A.E. recommended practice for passenger car front bumpers.



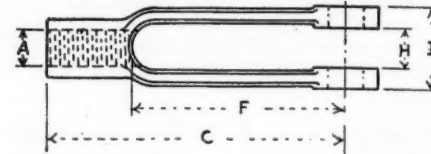
Two  $\frac{1}{2}$ -in. diameter bolt holes shall be located on or near the neutral axis of the frame section.

The first bolt-hole back from the spring eye may coincide with the first or second rivet hole.

In cases where the second bolt hole is to be used for mounting a shock absorbing device, the hole shall be located not more than  $1\frac{1}{2}$  in. from the bottom of the frame channel at the nearest point.

The present S.A.E. standard for automobile bumper mountings specifies that the distance from the center of the bumper face to the ground shall be 21 in. for front bumpers and 22 in. for rear bumpers, the width of the bumper face, which shall be flat, to be 2 in. for front bumpers and  $2\frac{1}{2}$  in. for rear bumpers. The overall length of the bumper specified in both cases is from 59 to 60 in.

The Parts and Fittings Division recommends that the present S. A. E. standard for adjustable yokes be extended by the addition of a  $\frac{1}{2}$ -in. adjustable yoke with a length of 3 in., the sizes to be classified as in the accompanying table.



Light Series Adjustable Yoke

A	C	F
$\frac{1}{8}$ —22	$1\frac{1}{8}$	$1\frac{1}{8}$
$\frac{1}{4}$ —28	2	$1\frac{1}{4}$
$\frac{3}{8}$ —24	$2\frac{1}{4}$	$1\frac{3}{8}$
$\frac{1}{2}$ —24	$2\frac{1}{2}$	$1\frac{1}{2}$
$\frac{5}{8}$ —20	$2\frac{3}{4}$	$1\frac{3}{4}$
$\frac{3}{4}$ —20	3	$1\frac{7}{8}$

Heavy Series Adjustable Yoke

A	C	F
$\frac{1}{2}$ —20	$4\frac{1}{8}$	$3\frac{1}{8}$
$\frac{5}{8}$ —18	$4\frac{1}{2}$	$3\frac{1}{2}$
$\frac{3}{4}$ —16	$6\frac{1}{8}$	$4\frac{1}{8}$
$\frac{7}{8}$ —14	$7\frac{1}{8}$	$5\frac{1}{8}$
1—14	8	6

Note: All other dimensions are the same as given in the table on page C9 of the S.A.E. HANDBOOK.

The Parts and Fittings Division recommends the accompanying table of plain steel washer size for adoption as S.A.E. standard:

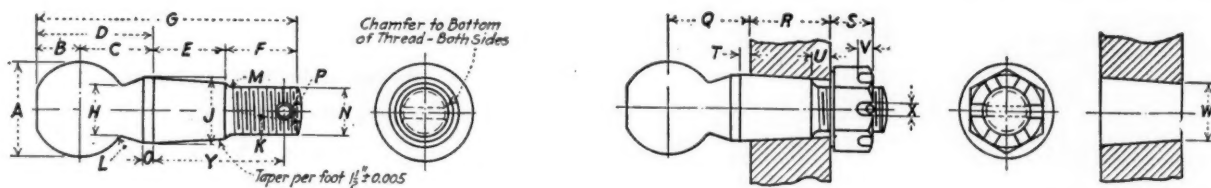
Plain Steel Washers

Bolt Diam.	Inside Diam.	Outside Diam.	Thickness $\pm 0.010$	Bolt Diam.	Inside Diam.	Outside Diam.	Thickness $\pm 0.010$
$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{16}$	$\frac{3}{8}$	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{1}{4}$
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	$1\frac{3}{4}$	$\frac{3}{8}$
$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{16}$	1	1	2	$\frac{1}{2}$
$\frac{1}{2}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{1}{4}$	$1\frac{1}{8}$	$1\frac{1}{8}$	$2\frac{1}{4}$	$\frac{3}{4}$
$\frac{5}{8}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{5}{16}$	$1\frac{1}{4}$	$1\frac{1}{4}$	$2\frac{1}{2}$	$\frac{7}{8}$
$\frac{3}{4}$	$\frac{3}{4}$	$\frac{7}{8}$	$\frac{3}{8}$	$1\frac{3}{4}$	$1\frac{3}{4}$	$2\frac{3}{4}$	$1$
$\frac{7}{8}$	$\frac{7}{8}$	1	$\frac{7}{16}$	$1\frac{1}{2}$	$1\frac{1}{2}$	3	$1\frac{1}{8}$

<sup>3</sup> This dimension permits use of scrap stock. Washers shall be flat and free from burrs.

The Parts and Fittings Division recommends that the dimensions for ball studs specified in the accompanying table be adopted as S.A.E. recommended practice.

Table of Recommended Standard Dimensions for Ball Studs



Nom.	A	B	C	D	E	F	G	H	J	K	L	M	N S.A.E. Thr'd.	O	P Drill No.	Q	R		S	T	U	V	W	X	Y
	Actual																max.	min.							
1/2	11±0.005	1/2	1/4	3/8	1/4	1/2	1 1/2	1/2	11±0.002	3/8	1/2	1/2	1/8-24	1/2	48	1/8-1/4	1/8	1/8	1/8	1/8-1/4	1/8-1/4	1/2	0.329±0.001	1/4	3/4
3/8	11±0.005	1/2	1/4	3/8	1/4	1/2	1 1/2	1/2	11±0.002	1/2	1/4	1/2	1/8-24	1/2	48	1/8-1/4	1/8	1/8	1/8	1/8-1/4	1/8-1/4	1/2	0.376±0.001	1/4	3/4
3/4	11±0.005	1/4	5/8	1 1/2	5/8	1/4	2 1/8	1/2	11±0.002	5/8	1/4	1/2	3/8-24	1/4	36	3/8-1/2	1/8	1/8	1/8	3/8-1/2	1/4-1/2	1/8	0.446±0.001	1/8	1 1/4
7/8	11±0.005	3/8	1 1/2	1 1/2	1 1/2	3/4	2 1/2	1/2	5/8±0.002	5/8	1/4	1/4	1/2-20	1/8	36	1/2-1/2	1/8	1/8	1/8	1/2-1/2	1/4-1/2	1/4	0.509±0.001	1/8	1 1/8
1	11±0.010	1/4	3/4	1 1/2	3/4	3/4	2 1/2	1/4	11±0.002	3/4	1/4	1/4	1/2-20	1/8	36	1/2-1/2	1/8	1/8	1/8	1/2-1/2	1/4-1/2	1/4	0.578±0.002	1/8	1 3/8
1 1/8	1 1/8±0.010	1/2	3/8	1 1/2	3/8	3/8	3 1/2	5/8	11±0.002	1	1/4	1/4	5/8-18	1/2	28	1 1/8-1/2	1 1/8	1/8	1/8	1 1/8-1/2	1/4-1/2	1/8	0.642±0.002	1/2	1 1/2
1 1/4	1 1/4±0.010	1/4	1 1/2	1 1/2	1 1/2	3/8	3 1/2	1 1/2	7/8±0.002	1	1/2	1/4	5/8-18	1/2	28	1 1/4-1/2	1 1/4	1 1/4	1/8	1 1/4-1/2	1/2-1/2	1/8	0.725±0.002	1/2	1 1/2
1 1/2	1 1/2±0.010	5/8	1 1/8	1 3/4	1 1/8	1 1/8	3 1/2	1 1/2	1 1/2±0.002	1 1/4	1/2	1/4	3/4-16	1/4	28	1 1/2-1/2	1 1/2	1 1/2	1/8	1 1/2-1/2	1/4-1/2	1/2	0.855±0.002	1/2	2
1 3/4	1 3/4±0.010	3/4	1 3/8	2 1/2	1 3/8	1 1/2	4 1/2	1 1/2	1 1/4±0.002	1 1/4	1/2	1/4	7/8-14	1/2	28	1 3/4-1/2	1 3/4	1 1/2	1/8	1 3/4-1/2	1/2-1/2	1/4	1.039±0.002	1/2	2 1/4
2	1 1/2±0.015	7/8	1 1/2	2 3/8	1 1/2	1 1/2	5 1/2	1 1/4	1 3/8±0.003	1 1/2	1/2	1/4	1-14	1/2	28	1 1/2-1/2	1 1/2	1 1/2	7/8	1 1/2-1/2	2 1/2-1/2	1/4	1.147±0.002	1/2	2 3/8
2 1/4	2 1/4±0.015	1	1 1/2	2 1/2	1 1/2	1 1/2	5 7/8	1 1/4	1 1/8±0.003	2	1/2	1/2	1 1/8-12	1/4	11	1 1/4-1/2	2 1/4	1 1/2	1/8	1 1/4-1/2	2 1/4-1/2	1/4	1.304±0.002	1/2	2 1/2
2 1/2	2 1/2±0.015	1 1/8	1 3/8	3	1 3/8	1 3/8	6 1/2	1 3/8	1 3/4±0.003	2	1/4	1/2	1 1/4-12	1/2	11	2 1/2-1/2	2 1/2	2	1 3/8	2 1/2-1/2	2 1/2-1/2	1/4	1.468±0.002	1/2	3 1/4
3	2 1/2±0.015	1 1/4	2 1/4	3 1/2	2 1/4	1 7/8	7 7/8	1 3/8	2 1/8±0.003	2 1/2	1/4	1/2	1 1/2-12	1/2	2	2 1/2-1/2	2 1/2	2 1/2	1 1/4	2 1/2-1/2	2 1/2-1/2	3/8	1.733±0.002	1/4	3 1/2



The Parts and Fittings Division recommends that the straight and taper shaft serrations shown in the accompanying illustrations and tables be adopted as S.A.E. recommended practice for serrated shaft fittings.

The Parts and Fittings Division recommends further:

That the present S.A.E. recommended practice for tank and radiator caps be extended by adding the note, "It is recom-

## STRAIGHT SERRATED FITTINGS

Nominal Diam.	Pitch Diam.		N	a <sup>1</sup> deg.	b <sup>1</sup> deg.	HOLE		SHAFT		
	Max.	Min.				Large Diam. Min.	Small Diam. Max. Min.	Outside Diam. Max. Min.	Inside Diam. Max. Min.	
1/8	0.122	0.120	36	90	80	0.125	0.118 0.117	0.124 0.123	0.116	
3/16	0.182	0.180	36	90	80	0.187	0.176 0.175	0.186 0.185	0.174	
1/4	0.243	0.241	36	90	80	0.250	0.235 0.234	0.249 0.248	0.233	
5/16	0.303	0.301	36	90	80	0.312	0.293 0.292	0.311 0.310	0.291	
3/8	0.363	0.361	36	90	80	0.375	0.352 0.351	0.374 0.373	0.350	
1/2	0.485	0.483	36	90	80	0.500	0.469 0.468	0.499 0.498	0.467	
5/8	0.605	0.603	36	90	80	0.625	0.584 0.583	0.624 0.623	0.582	
3/4	0.733	0.731	48	90	82 1/2	0.750	0.716 0.714	0.749 0.747	0.713	
7/8	0.855	0.853	48	90	82 1/2	0.875	0.835 0.833	0.874 0.872	0.832	
1	0.977	0.975	48	90	82 1/2	1.000	0.954 0.952	0.999 0.997	0.951	
1 1/8	1.098	1.096	48	90	82 1/2	1.125	1.071 1.069	1.124 1.122	1.068	
1 1/4	1.220	1.218	48	90	82 1/2	1.250	1.190 1.188	1.249 1.247	1.187	
1 3/8	1.342	1.340	48	90	82 1/2	1.375	1.309 1.307	1.374 1.372	1.306	
1 1/2	1.464	1.462	48	90	82 1/2	1.500	1.428 1.426	1.499 1.497	1.425	
1 3/4	1.708	1.706	48	90	82 1/2	1.750	1.666 1.664	1.749 1.747	1.663	
2	1.952	1.949	48	90	82 1/2	2.000	1.904 1.902	1.999 1.997	1.901	
2 1/4	2.196	2.193	48	90	82 1/2	2.250	2.142 2.140	2.249 2.247	2.139	
2 1/2	2.440	2.437	48	90	82 1/2	2.500	2.380 2.378	2.499 2.497	2.377	
2 3/4	2.684	2.681	48	90	82 1/2	2.750	2.618 2.616	2.749 2.747	2.615	
3	2.928	2.925	48	90	82 1/2	3.000	2.856 2.854	2.999 2.997	2.853	

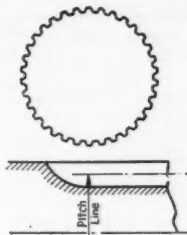
All dimensions in inches.

TABLE 1—ALLOWANCES AND TOLERANCES FOR SCREWS AND NUTS, CLASS IIA, FREE FIT

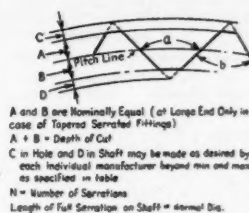
Threads Per In.	Allowance, In.	Pitch-Diameter Tolerances, In.	Lead, <sup>1</sup> In.	Half Angle, min. sec.
80	0.0000	0.0017	0.0005	2—50
72	0.0000	0.0018	0.0005	2—41
64	0.0000	0.0019	0.0005	2—23
56	0.0000	0.0020	0.0006	2—11
48	0.0000	0.0022	0.0006	2—04
44	0.0000	0.0023	0.0007	2—03
40	0.0000	0.0024	0.0007	1—52
36	0.0000	0.0025	0.0007	1—49
32	0.0000	0.0027	0.0008	1—41
28	0.0000	0.0031	0.0009	1—45
24	0.0000	0.0033	0.0009	1—32
20	0.0000	0.0036	0.0010	1—24
18	0.0000	0.0041	0.0012	1—26
16	0.0000	0.0045	0.0013	1—24
14	0.0000	0.0049	0.0014	1—20
13	0.0000	0.0052	0.0015	1—19
12	0.0000	0.0056	0.0016	1—18
11	0.0000	0.0059	0.0017	1—15
10	0.0000	0.0064	0.0018	1—14
9	0.0000	0.0070	0.0020	1—13
8	0.0000	0.0076	0.0022	1—11
7	0.0000	0.0085	0.0024	1—09
6	0.0000	0.0101	0.0029	1—10
5	0.0000	0.0116	0.0033	1—07
4 1/2	0.0000	0.0127	0.0037	1—06
4	0.0000	0.0140	0.0040	1—05

<sup>1</sup> Variation in lead between any two threads not farther apart than the length of engagement.

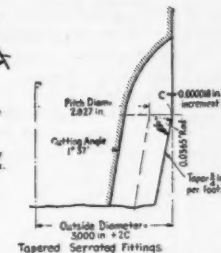
The tolerances specified for the pitch diameters are cumulative and include all errors of lead and angle. The full tolerance on the pitch diameter is therefore not available unless the lead and the angle of the thread are perfect. The last two columns give as general information the error in lead, per length of thread engaged, and in angle respectively that can each be compensated for by half the tolerance of the pitch diameter. If the lead and the angle error both exist to the amount tabulated, the pitch diameter of a bolt, for example, must be reduced by the full tolerance or it will not enter a basic nut or gage. If no lead error existed on such a bolt, the angle error could be twice that given, and conversely; but these extreme conditions are not contemplated as being desirable.



Straight Serrated Fittings



A and B are Nominally Equal (at Large End Only in case of Tapered Serrated Fittings)  
A + B = Depth of Cut  
C in Hole and D in Shaft may be made as desired by each individual manufacturer beyond min. and max. as specified in table  
N = Number of Serrations  
Length of Full Serration on Shaft = nominal Dia.



Tapered Serrated Fittings

## TAPERED SERRATED FITTINGS

Nominal Diam.	Pitch Diam.		N	a, deg.	b, deg.	HOLE		SHAFT		
	Max.	Min.				Large Diam. Min.	Small Diam. Max. Min.	Outside Diam. Max. Min.	Inside Diam. Max. Min.	
1/8	0.485	0.483	36	90	80	0.500	0.469 0.468	0.499 0.498	0.467	
3/16	0.605	0.603	36	90	80	0.625	0.584 0.583	0.624 0.623	0.582	
1/4	0.733	0.731	36	90	80	0.750	0.716 0.714	0.749 0.747	0.713	
5/16	0.855	0.853	36	90	80	0.875	0.835 0.833	0.874 0.872	0.832	
3/8	0.977	0.975	36	90	80	1.000	0.954 0.952	0.999 0.997	0.951	
1/2	1.098	1.096	36	90	80	1.125	1.071 1.069	1.124 1.122	1.068	
5/8	1.220	1.218	36	90	80	1.250	1.190 1.188	1.249 1.247	1.187	
3/4	1.342	1.340	36	90	80	1.375	1.309 1.307	1.374 1.372	1.306	
7/8	1.464	1.462	36	90	80	1.500	1.428 1.426	1.499 1.497	1.425	
1	1.708	1.706	36	90	80	1.750	1.666 1.664	1.749 1.747	1.663	
2	1.952	1.949	48	90	82 1/2	2.000	1.904 1.902	1.999 1.997	1.901	
2 1/4	2.196	2.193	48	90	82 1/2	2.250	2.142 2.140	2.249 2.247	2.139	
2 1/2	2.440	2.437	48	90	82 1/2	2.500	2.380 2.378	2.499 2.497	2.377	
2 3/4	2.684	2.681	48	90	82 1/2	2.750	2.618 2.616	2.749 2.747	2.615	
3	2.928	2.925	48	90	82 1/2	3.000	2.856 2.854	2.999 2.997	2.853	

All dimensions in inches and apply to large end of taper only.  
Taper 3/4 in. per ft. on outside diameter.  
Cutting Angle 1 deg. 37 min.

TABLE 2—ALLOWANCES AND TOLERANCES FOR SCREWS AND NUTS, CLASS IIB, MEDIUM FIT

Threads Per In.	Allowance, In.	Pitch-Diameter Tolerances, In.	Lead, <sup>1</sup> In.	Half Angle, min. sec.
80	0.0000	0.0013	0.0004	2—07
72	0.0000	0.0013	0.0004	1—54
64	0.0000	0.0014	0.0004	1—49
56	0.0000	0.0015	0.0004	1—41
48	0.0000	0.0016	0.0005	1—32
44	0.0000	0.0016	0.0005	1—24
40	0.0000	0.0017	0.0005	1—21
36	0.0000	0.0018	0.0005	1—17
32	0.0000	0.0019	0.0005	1—12
28	0.0000	0.0022	0.0006	1—13
24	0.0000	0.0024	0.0007	1—08
20	0.0000	0.0026	0.0008	1—02
18	0.0000	0.0030	0.0009	1—04
16	0.0000	0.0032	0.0009	1—01
14	0.0000	0.0036	0.0010	1—00
13	0.0000	0.0037	0.0011	0—57
12	0.0000	0.0040	0.0012	0—57
11	0.0000	0.0042	0.0012	0—55
10	0.0000	0.0045	0.0013	0—54
9	0.0000	0.0049	0.0014	0—52
8	0.0000	0.0054	0.0016	0—51
7	0.0000	0.0059	0.0017	0—49
6	0.0000	0.0071	0.0020	0—50
5	0.0000	0.0082	0.0024	0—48
4 1/2	0.0000	0.0089	0.0026	0—47
4	0.0000	0.0097	0.0028	0—46

TABLE 3—CLASS IIA, FREE FIT, FOR SCREWS OF THE COARSE THREAD SERIES

Size	Threads Per Inch	Major Diameter			Pitch Diameter			Minor Diameter		
		Max. <sup>1</sup>	Tolerance	Min.	Max. <sup>1</sup>	Tolerance <sup>2</sup>	Min.	Max. <sup>3</sup>	Tolerance	Min.
1	64	0.0730	0.0038	0.0692	0.0629	0.0019	0.0610	0.0538	0.0030	0.0508
2	56	0.0860	0.0040	0.0820	0.0744	0.0020	0.0724	0.0641	0.0033	0.0608
3	48	0.0990	0.0044	0.0946	0.0855	0.0022	0.0833	0.0754	0.0037	0.0697
4	40	0.1120	0.0048	0.1072	0.0958	0.0024	0.0934	0.0813	0.0042	0.0771
5	40	0.1250	0.0048	0.1202	0.1088	0.0024	0.1064	0.0943	0.0042	0.0901
6	32	0.1380	0.0054	0.1326	0.1177	0.0027	0.1150	0.0997	0.0050	0.0947
8	32	0.1640	0.0054	0.1586	0.1437	0.0027	0.1410	0.1257	0.0050	0.1207
10	24	0.1900	0.0066	0.1834	0.1629	0.0033	0.1596	0.1389	0.0063	0.1326
12	24	0.2160	0.0066	0.2094	0.1889	0.0033	0.1856	0.1649	0.0063	0.1586
12	20	0.2500	0.0072	0.2428	0.2175	0.0036	0.2139	0.1887	0.0073	0.1814
1 1/8	18	0.3125	0.0082	0.3043	0.2764	0.0041	0.2723	0.2443	0.0081	0.2362
1 1/4	16	0.3750	0.0090	0.3660	0.3344	0.0045	0.3299	0.2993	0.0090	0.2893
1 1/2	14	0.4375	0.0098	0.4277	0.3911	0.0049	0.3862	0.3499	0.0101	0.3398
1 3/8	12	0.5000	0.0104	0.4896	0.4500	0.0052	0.4448	0.4056	0.0107	0.3949
1 3/4	12	0.5625	0.0112	0.5513	0.5084	0.0056	0.5028	0.4603	0.0117	0.4486
1 7/8	11	0.6250	0.0118	0.6132	0.5660	0.0059	0.5601	0.5135	0.0125	0.5010
2	10	0.7500	0.0128	0.7372	0.6850	0.0064	0.6786	0.6273	0.0136	0.6137
2 1/8	9	0.8750	0.0140	0.8610	0.8028	0.0070	0.7958	0.7387	0.0150	0.7237
2 1/4	8	1.0000	0.0152	0.9848	0.9188	0.0076	0.9112	0.8466	0.0166	0.8300
2 1/2	7	1.1250	0.0170	1.1080	1.0322	0.0085	1.0287	0.9497	0.0188	0.9309
2 3/4	6	1.2500	0.0170	1.2330	1.1572	0.0085	1.1487	1.0747	0.0188	1.0539
3	6	1.5000	0.0232	1.4768	1.3917	0.0102	1.3816	1.2965	0.0219	1.2734
3 1/8	5	1.7500	0.0232	1.7268	1.6201	0.0116	1.6085	1.5046	0.0260	1.4786
3 1/4	4 1/2	2.0000	0.0254	1.9746	1.8557	0.0127	1.8430	1.7274	0.0288	1.6986
3 1/2	4 1/2	2.2500	0.0254	2.2246	2.1057	0.0127	2.0930	1.9774	0.0288	1.9486
3 3/4	4	2.5000	0.0280	2.4720	2.3376	0.0140	2.3236	2.1933	0.0321	2.1612
4	4	2.7500	0.0280	2.7220	2.5876	0.0140	2.5736	2.4433	0.0321	2.4112
4 1/8	4	3.0000	0.0280	2.9720	2.8376	0.0140	2.8236	2.6933	0.0321	2.6612

TABLE 4—CLASS IIA, FREE FIT, FOR NUTS OF THE COARSE THREAD SERIES

Size	Threads Per Inch	Major Diameter			Pitch Diameter			Minor Diameter		
		Min. <sup>2</sup>	Tolerance	Max.	Min. <sup>1</sup>	Tolerance <sup>2</sup>	Max.	Min.	Tolerance	Max.
1	64	0.0741	0.0031	0.0772	0.0629	0.0019	0.0648	0.0561	0.0017	0.0578
2	56	0.0873	0.0033	0.0906	0.0744	0.0020	0.0764	0.0667	0.0019	0.0686
3	48	0.1005	0.0037	0.1042	0.0855	0.0022	0.0877	0.0764	0.0023	0.0787
4	40	0.1138	0.0042	0.1180	0.0958	0.0024	0.0982	0.0849	0.0027	0.0876
5	40	0.1268	0.0042	0.1310	0.1088	0.0024	0.1112	0.0979	0.0027	0.1008
6	32	0.1403	0.0049	0.1452	0.1177	0.0027	0.1204	0.1042	0.0034	0.1076
8	32	0.1663	0.0049	0.1712	0.1437	0.0027	0.1464	0.1302	0.0034	0.1336
10	24	0.1930	0.0063	0.1993	0.1629	0.0033	0.1662	0.1449	0.0045	0.1494
12	24	0.2190	0.0063	0.2253	0.1889	0.0033	0.1922	0.1709	0.0045	0.1754
12	20	0.2536	0.0072	0.2608	0.2175	0.0036	0.2211	0.1959	0.0054	0.2013
1 1/8	18	0.3165	0.0081	0.3246	0.2764	0.0041	0.2805	0.2524	0.0060	0.2584
1 1/4	16	0.3795	0.0090	0.3885	0.3344	0.0045	0.3389	0.3073	0.0068	0.3141
1 1/2	14	0.4427	0.0100	0.4527	0.3911	0.0049	0.3960	0.3602	0.0077	0.3679
1 3/8	12	0.5056	0.0107	0.5163	0.4500	0.0052	0.4552	0.4167	0.0084	0.4251
1 3/4	12	0.5685	0.0116	0.5801	0.5084	0.0056	0.5140	0.4723	0.0090	0.4813
1 7/8	11	0.6316	0.0124	0.6440	0.5660	0.0059	0.5719	0.5266	0.0098	0.5364
2	10	0.7572	0.0136	0.7708	0.6850	0.0064	0.6914	0.6417	0.0109	0.6526
2 1/8	9	0.8830	0.0150	0.8980	0.8028	0.0070	0.8098	0.7547	0.0120	0.7667
2 1/4	8	1.0090	0.0166	1.0256	0.9188	0.0076	0.9264	0.8647	0.0135	0.8782
2 1/2	7	1.1353	0.0188	1.1541	1.0322	0.0085	1.0407	0.9704	0.0154	0.9858
2 3/4	6	1.2603	0.0188	1.2791	1.1572	0.0085	1.1657	1.0954	0.0154	1.1108
3	6	1.5120	0.0222	1.5342	1.3917	0.0101	1.4018	1.3196	0.0180	1.3376
3 1/8	5	1.7644	0.0261	1.7905	1.6201	0.0116	1.6317	1.5335	0.0216	1.5551
3 1/4	4 1/2	2.0160	0.0288	2.0448	1.8557	0.0127	1.8684	1.7594	0.0241	1.7835
3 1/2	4 1/2	2.2660	0.0288	2.2948	2.1057	0.0127	2.1184	2.0094	0.0241	2.0335
3 3/4	4	2.5180	0.0321	2.5501	2.3376	0.0140	2.3516	2.2294	0.0270	2.2564
4	4	2.7680	0.0321	2.8001	2.5876	0.0140	2.6016	2.4794	0.0270	2.5064
4 1/8	4	3.0180	0.0321	3.0501	2.8376	0.0140	2.8516	2.7294	0.0270	2.7564

<sup>1</sup>Basic diameters. <sup>2</sup>Dimensions given are figured to the intersection of the worn tool arc with a centerline through crest and root.  
<sup>3</sup>The tolerances specified for the pitch diameter are cumulative and include all errors of lead and angle

mended that on passenger cars, motor trucks and tractors gasoline tank filler pipes have a minimum clear opening of 2 in. in diameter."

That the present S.A.E. standard be extended to include the accompanying temper and toughness tests.

**Temper Test.**—After compressing the lock washer to flat, the reaction shall be sufficient to indicate necessary spring power, and on a subsequent compression to flat the lock washer shall manifest no appreciable loss in reaction.

**Toughness Test.**—Forty-five per cent of the lock washer, including one end, shall be secured firmly in a vise, and 45 per cent, including the other end, shall be secured firmly between parallel jaws of a wrench. Movement of wrench at right angles to the helical curve shall twist the lock washer through 45 deg. without it showing signs of fracturing, and shall twist the lock washer entirely apart within 135 deg.

The Screw Threads Division recommends that the present S.A.E. standard for screw threads be extended to include the accompanying Tables Nos. 1 to 7 inclusive, together with the following definitions.

TABLE 5—CLASS IIB, MEDIUM FIT, FOR SCREWS OF THE COARSE THREAD SERIES

Size	Threads Per Inch	Major Diameter, in.			Pitch Diameter, in.			Minor Diameter, in.		
		Max. <sup>1</sup>	Tolerance	Min.	Max. <sup>1</sup>	Tolerance <sup>2</sup>	Min.	Max. <sup>2</sup>	Tolerance	Min.
1	64	0.0730	0.0028	0.0702	0.0629	0.0014	0.0615	0.0538	0.0025	0.0513
2	56	0.0860	0.0030	0.0830	0.0744	0.0015	0.0729	0.0641	0.0028	0.0613
3	48	0.0990	0.0032	0.0958	0.0855	0.0016	0.0839	0.0734	0.0031	0.0703
4	40	0.1120	0.0034	0.1086	0.0958	0.0017	0.0941	0.0813	0.0035	0.0778
5	40	0.1250	0.0034	0.1216	0.1088	0.0017	0.1071	0.0943	0.0035	0.0908
6	32	0.1380	0.0038	0.1342	0.1177	0.0019	0.1158	0.0997	0.0042	0.0955
8	32	0.1640	0.0038	0.1602	0.1437	0.0019	0.1418	0.1257	0.0042	0.1215
10	24	0.1900	0.0048	0.1852	0.1629	0.0024	0.1605	0.1389	0.0054	0.1353
12	24	0.2160	0.0048	0.2112	0.1889	0.0024	0.1865	0.1649	0.0054	0.1595
12	20	0.2500	0.0052	0.2448	0.2175	0.0026	0.2149	0.1887	0.0063	0.1824
1 1/8	18	0.3125	0.0060	0.3065	0.2764	0.0030	0.2734	0.2443	0.0070	0.2373
1 1/4	16	0.3750	0.0064	0.3686	0.3344	0.0032	0.3312	0.2983	0.0076	0.2906
1 1/2	14	0.4375	0.0072	0.4303	0.3911	0.0036	0.3875	0.3499	0.0088	0.3411
1 3/8	12	0.5000	0.0074	0.4926	0.4500	0.0037	0.4463	0.4056	0.0092	0.3964
1 3/4	12	0.5625	0.0080	0.5545	0.5084	0.0040	0.5043	0.4603	0.0101	0.4502
1 7/8	11	0.6250	0.0084	0.6166	0.5660	0.0042	0.5618	0.5135	0.0108	0.5027
2	10	0.7500	0.0090	0.7410	0.6850	0.0045	0.6805	0.6273	0.0117	0.6156
2 1/8	9	0.8750	0.0098	0.8652	0.8028	0.0049	0.7979	0.7387	0.0129	0.7258
2 1/4	8	1.0000	0.0108	0.9892	0.9188	0.0054	0.9134	0.8466	0.0144	0.8322
2 1/2	7	1.1250	0.0118	1.1132	1.0322	0.0059	1.0263	0.9497	0.0162	0.9335
2 3/4	6	1.2500	0.0118	1.2382	1.1572	0.0059	1.1513	1.0747	0.0162	1.0585
3	6	1.5000	0.0142	1.4858	1.3917	0.0071	1.3846	1.2955	0.0191	1.2764
3 1/8	5	1.7500	0.0164	1.7336	1.6201	0.0082	1.6119	1.5056	0.0216	1.4820
3 1/4	4 1/2	2.0000	0.0178	1.9822	1.8557	0.0089	1.8468	1.7274	0.0250	1.7024
3 1/2	4 1/2	2.2500	0.0178	2.2322	2.1057	0.0089	2.0968	1.9774	0.0250	1.9524
3 3/4	4	2.5000	0.0194	2.4806	2.3376	0.0097	2.3279	2.1933	0.0278	2.1655
4	4	2.7500	0.0194	2.7306	2.5876	0.0097	2.5779	2.4433	0.0278	2.4155
4 1/8	4	3.0000	0.0194	2.9806	2.8376	0.0097	2.8279	2.6933	0.0278	2.6655

TABLE 6—CLASS IIB, MEDIUM FIT, FOR NUTS OF THE COARSE THREAD SERIES

TABLE 6—CLASS IIB, MEDIUM FIT, FOR NUTS OF THE COARSE THREAD SERIES										
Size	Threads Per Inch	Major Diameter			Pitch Diameter			Minor Diameter		
		Min. <sup>2</sup>	Tolerance	Max.	Min. <sup>1</sup>	Tolerance <sup>2</sup>	Max.	Min.	Tolerance	Max.
1	64	0.0741	0.0026	0.0767	0.0629	0.0014	0.0643	0.0561	0.0017	0.0578
2	56	0.0873	0.0028	0.0901	0.0744	0.0015	0.0759	0.0667	0.0019	0.0686
3	48	0.1005	0.0031	0.1036	0.0855	0.0016	0.0871	0.0764	0.0023	0.0787
4	40	0.1138	0.0035	0.1173	0.0958	0.0017	0.0975	0.0849	0.0027	0.0876
5	40	0.1268	0.0035	0.1303	0.1088	0.0017	0.1105	0.0979	0.0027	0.1006
6	32	0.1403	0.0041	0.1444	0.1177	0.0019	0.1196	0.1042	0.0034	0.1076
8	32	0.1663	0.0041	0.1704	0.1437	0.0019	0.1456	0.1302	0.0034	0.1336
10	24	0.1937	0.0047	0.1984	0.1629	0.0024	0.1651	0.1449	0.0042	0.1481
12	24	0.2180	0.0054	0.2244	0.1889	0.0024	0.1913	0.1709	0.0045	0.1754
1/4	20	0.2536	0.0062	0.2598	0.2175	0.0026	0.2201	0.1959	0.0054	0.2013
1/2	18	0.3165	0.0070	0.3235	0.2764	0.0030	0.2794	0.2524	0.0060	0.2584
3/8	16	0.3795	0.0077	0.3872	0.3344	0.0032	0.3376	0.3073	0.0068	0.3141
7/16	14	0.4427	0.0087	0.4514	0.3911	0.0036	0.3947	0.3602	0.0077	0.3679
1/2	12	0.5056	0.0092	0.5148	0.4500	0.0037	0.4537	0.4167	0.0084	0.4251
5/8	13	0.5685	0.0100	0.5785	0.5084	0.0040	0.5124	0.4723	0.0090	0.4813
3/4	11	0.6316	0.0107	0.6423	0.5660	0.0042	0.5702	0.5266	0.0098	0.5364
1	10	0.7572	0.0117	0.7689	0.6850	0.0045	0.6895	0.6417	0.0109	0.6526
1 1/8	9	0.8530	0.0129	0.8659	0.8028	0.0049	0.8077	0.7547	0.0120	0.7667
1 1/4	8	1.0070	0.0144	1.0234	0.9188	0.0054	0.9242	0.8647	0.0135	0.8782
1 1/2	7	1.1353	0.0162	1.1515	1.0322	0.0059	1.0381	0.9704	0.0154	0.9858
1 3/4	7	1.2603	0.0162	1.2765	1.1572	0.0059	1.1631	1.0954	0.0154	1.1108
2	6	1.5120	0.0192	1.5312	1.3917	0.0071	1.3988	1.3196	0.0180	1.3376
1 3/8	7	1.7944	0.0227	1.7871	1.6201	0.0082	1.6283	1.5335	0.0216	1.5451
2 1/4	4 1/2	2.0160	0.0250	2.0410	1.8557	0.0089	1.8646	1.7594	0.0241	1.7685
2 1/2	4 1/2	2.2660	0.0250	2.2910	2.1057	0.0089	2.1146	2.0094	0.0241	2.0335
2 3/4	4	2.5180	0.0278	2.5438	2.3376	0.0097	2.3473	2.2294	0.0270	2.2564
3	4	2.7680	0.0278	2.7938	2.5876	0.0097	2.5973	2.4794	0.0270	2.5064
3 1/2	4	3.0180	0.0278	3.0458	2.8376	0.0097	2.8473	2.7294	0.0270	2.7564



TABLE 7—CLASS IIA, FREE FIT, FOR SCREWS OF THE FINE THREAD SERIES

Size	Threads Per Inch	Major Diameter			Pitch Diameter			Minor Diameter		
		Max. <sup>1</sup>	Tolerance	Min.	Max. <sup>1</sup>	Tolerance <sup>2</sup>	Min.	Max. <sup>3</sup>	Tolerance	Min.
0	80	0.0600	0.0034	0.0566	0.0519	0.0017	0.0502	0.0447	0.0026	0.0421
1	72	0.0730	0.0036	0.0694	0.0640	0.0018	0.0622	0.0560	0.0028	0.0532
2	64	0.0860	0.0038	0.0822	0.0759	0.0019	0.0740	0.0668	0.0030	0.0638
3	56	0.0990	0.0040	0.0950	0.0874	0.0020	0.0854	0.0771	0.0033	0.0738
4	48	0.1120	0.0044	0.1076	0.0985	0.0022	0.0963	0.0864	0.0037	0.0827
5	44	0.1250	0.0046	0.1204	0.1102	0.0023	0.1079	0.0971	0.0039	0.0932
6	40	0.1380	0.0048	0.1332	0.1218	0.0024	0.1194	0.1073	0.0042	0.1031
8	36	0.1640	0.0050	0.1590	0.1460	0.0025	0.1435	0.1299	0.0045	0.1254
10	32	0.1900	0.0054	0.1846	0.1697	0.0027	0.1670	0.1517	0.0050	0.1467
12	28	0.2160	0.0062	0.2098	0.1928	0.0031	0.1897	0.1722	0.0057	0.1665
1/4	28	0.2500	0.0062	0.2438	0.2268	0.0031	0.2237	0.2062	0.0057	0.2005
1/2	24	0.3125	0.0066	0.3059	0.2854	0.0033	0.2821	0.2614	0.0063	0.2551
3/4	24	0.3750	0.0066	0.3684	0.3479	0.0033	0.3446	0.3239	0.0063	0.3176
1	20	0.4375	0.0072	0.4303	0.4050	0.0036	0.4014	0.3762	0.0073	0.3699
1 1/4	20	0.5000	0.0072	0.4928	0.4675	0.0036	0.4639	0.4387	0.0073	0.4314
1 1/2	18	0.5625	0.0082	0.5543	0.5264	0.0041	0.5243	0.4943	0.0081	0.4862
1 3/4	18	0.6250	0.0082	0.6168	0.5889	0.0041	0.5848	0.5568	0.0081	0.5487
2	16	0.7500	0.0090	0.7410	0.7094	0.0045	0.7049	0.6733	0.0090	0.6643
2 1/4	14	0.8750	0.0098	0.8652	0.8286	0.0049	0.8237	0.7874	0.0101	0.7733
2 1/2	14	1.0000	0.0098	0.9902	0.9536	0.0049	0.9487	0.9124	0.0101	0.9023
1 1/8	12	1.1250	0.0112	1.1138	1.0709	0.0056	1.0653	1.0228	0.0117	1.0111
1 3/8	12	1.2500	0.0112	1.2388	1.1959	0.0056	1.1903	1.1478	0.0117	1.1361
1 5/8	12	1.5000	0.0112	1.4888	1.4459	0.0056	1.4403	1.3978	0.0117	1.3861

<sup>1</sup> Basic diameters.<sup>2</sup> Dimensions given are figured to the intersection of the worm tool arc with a centerline through crest and root.<sup>3</sup> The tolerances specified for the pitch diameter are cumulative and include all errors of lead and angle.

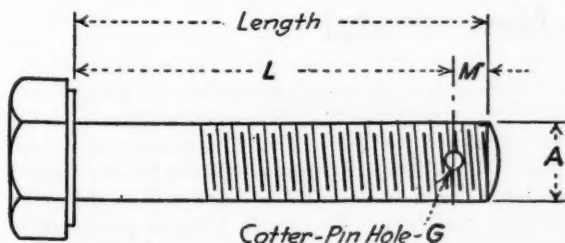
TABLE 8—CLASS IIA, FREE FIT, FOR NUTS OF THE FINE THREAD SERIES

Size	Threads Per Inch	Major Diameter			Pitch Diameter			Minor Diameter		
		Min. <sup>2</sup>	Tolerance	Max.	Min. <sup>1</sup>	Tolerance <sup>3</sup>	Max.	Min.	Tolerance	Max.
0	80	0.0609	0.0024	0.0635	0.0519	0.0017	0.0536	0.0465	0.0013	0.0478
1	72	0.0740	0.0028	0.0768	0.0640	0.0018	0.0658	0.0580	0.0015	0.0595
2	64	0.0871	0.0031	0.0902	0.0759	0.0019	0.0778	0.0691	0.0017	0.0708
3	56	0.1003	0.0033	0.1036	0.0874	0.0020	0.0894	0.0797	0.0019	0.0816
4	48	0.1135	0.0037	0.1172	0.0985	0.0022	0.1007	0.0894	0.0023	0.0917
5	44	0.1266	0.0040	0.1306	0.1102	0.0023	0.1125	0.1004	0.0025	0.1029
6	40	0.1398	0.0042	0.1440	0.1218	0.0024	0.1242	0.1109	0.0027	0.1136
8	36	0.1660	0.0045	0.1705	0.1460	0.0025	0.1485	0.1339	0.0030	0.1369
10	32	0.1923	0.0049	0.1972	0.1697	0.0027	0.1724	0.1562	0.0034	0.1596
12	28	0.2186	0.0057	0.2243	0.1928	0.0031	0.1959	0.1773	0.0039	0.1812
1/4	28	0.2526	0.0057	0.2583	0.2268	0.0031	0.2299	0.2113	0.0039	0.2152
1/2	24	0.3155	0.0063	0.3218	0.2854	0.0033	0.2887	0.2674	0.0045	0.2719
3/4	24	0.3780	0.0063	0.3843	0.3479	0.0033	0.3512	0.3299	0.0045	0.3344
1	20	0.4411	0.0072	0.4483	0.4050	0.0036	0.4086	0.3834	0.0054	0.3888
1 1/4	20	0.5036	0.0072	0.5108	0.4675	0.0036	0.4711	0.4459	0.0054	0.4513
1 1/2	18	0.5665	0.0081	0.5746	0.5264	0.0041	0.5305	0.5024	0.0050	0.5084
1 3/4	18	0.6290	0.0081	0.6371	0.5889	0.0041	0.5930	0.5649	0.0050	0.5709
2	16	0.7545	0.0090	0.7635	0.7094	0.0045	0.7139	0.6823	0.0068	0.6891
2 1/4	14	0.8802	0.0100	0.8902	0.8286	0.0049	0.8335	0.7977	0.0077	0.8054
2 1/2	14	1.0052	0.0100	1.0152	0.9536	0.0049	0.9585	0.9227	0.0077	0.9304
1 1/8	12	1.1310	0.0116	1.1426	1.0709	0.0056	1.0765	1.0348	0.0090	1.0438
1 3/8	12	1.2560	0.0116	1.2676	1.1959	0.0056	1.2015	1.1598	0.0090	1.1688
1 5/8	12	1.5060	0.0116	1.5176	1.4459	0.0056	1.4515	1.4098	0.0090	1.4188

<sup>1</sup> Basic diameters.<sup>2</sup> Dimensions given are figured to the intersection of the worm tool arc with a centerline through crest and root.<sup>3</sup> The tolerances specified for the pitch diameter are cumulative and include all errors of lead and angle.

The Screw Threads Division recommends that the explanatory text in the S.A.E. standard for screws, bolts and nuts be revised and extended to read:

The length of the effective thread of screws and bolts shall be:  $D \times 1.5 + \frac{1}{4}$  in. As bolts and screws conforming to these specifications are primarily intended



Cotter-pin holes shall be located by dimension L

A†	G†	M	A†	G†	M	A†	G†	M
1/4-28	1/8	1/8	1/2-18	3/8	3/8	1-14	1/2	1/2
1/8-24	3/16	3/16	3/4-16	1/2	1/2	1 1/8-12	3/4	3/4
3/16-24	1/4	1/4	1-16	3/4	3/4	1 1/4-12	1	1
1/2-20	3/8	3/8	1 1/4-16	1	1	1 3/8-12	1 1/4	1 1/4
3/4-16	1/2	1/2	1 3/8-16	1 1/4	1 1/4	1 1/2-12	1 1/2	1 1/2

TABLE 9—CLASS IIB, MEDIUM FIT, FOR SCREWS OF THE FINE THREAD SERIES

Size	Threads Per Inch	Major Diameter			Pitch Diameter			Minor Diameter		
		Max. <sup>1</sup>	Tolerance	Min.	Max. <sup>1</sup>	Tolerance <sup>2</sup>	Min.	Max. <sup>3</sup>	Tolerance	Min.
0	80	0.0600	0.0026	0.0574	0.0519	0.0013	0.0506	0.0447	0.0022	0.0425
1	72	0.0730	0.0026	0.0704	0.0640	0.0013	0.0627	0.0560	0.0023	0.0537
2	64	0.0860	0.0028	0.0832	0.0759	0.0014	0.0745	0.0668	0.0025	0.0643
3	56	0.0990	0.0030	0.0960	0.0874	0.0015	0.0859	0.0771	0.0028	0.0743
4	48	0.1120	0.0032	0.1088	0.0985	0.0016	0.0969	0.0864	0.0031	0.0833
5	44	0.1250	0.0032	0.1218	0.1102	0.0016	0.1086	0.0971	0.0032	0.0939
6	40	0.1380	0.0034	0.1346	0.1218	0.0017	0.1201	0.1073	0.0035	0.1038
8	36	0.1640	0.0036	0.1604	0.1460	0.0018	0.1442	0.1299	0.0038	0.1261
10	32	0.1900	0.0038	0.1862	0.1697	0.0019	0.1678	0.1517	0.0042	0.1475
12	28	0.2160	0.0044	0.2116	0.1928	0.0022	0.1906	0.1722	0.0048	0.1674
1/4	28	0.2500	0.0044	0.2456	0.2268	0.0022	0.2246	0.2062	0.0048	0.2014
1/2	24	0.3125	0.0048	0.3077	0.2854	0.0024	0.2830	0.2614	0.0054	0.2560
3/4	24	0.3750	0.0048	0.3702	0.3479	0.0024	0.3455	0.3239	0.0054	0.3185
1	20	0.4375	0.0052	0.4323	0.4050	0.0026	0.4024	0.3762	0.0063	0.3699
1 1/4	20	0.5000	0.0052	0.4948	0.4675	0.0026	0.4649	0.4387	0.0063	0.4324
1 1/2	18	0.5625	0.0060	0.5565	0.5264	0.0030	0.5234	0.4943	0.0070	0.4873
1 3/4	18	0.6250	0.0060	0.6190	0.5889	0.0030	0.5859	0.5568	0.0070	0.5498
2	16	0.7500	0.0064	0.7436	0.7094	0.0032	0.7062	0.6733	0.0077	0.6658
2 1/4	14	0.8750	0.0072	0.8678	0.8286	0.0036	0.8250	0.7874	0.0088	0.7786
2 1/2	14	1.0000	0.0072	0.9928	0.9536	0.0036	0.9500	0.9124	0.0088	0.9036
1 1/8	12	1.1250	0.0080	1.1170	1.0709	0.0040	1.0669	1.0228	0.0101	1.0127
1 3/8	12	1.2500	0.0080	1.2420	1.1959	0.0040	1.1919	1.1478	0.0101	1.1377
1 5/8	12	1.5000	0.0080	1.4920	1.4459	0.0040	1.4419	1.3978	0.0101	1.3877

<sup>1</sup> Basic diameters.<sup>2</sup> Dimensions given are figured to the intersection of the worm tool arc with a centerline through crest and root.<sup>3</sup> The tolerances specified for the pitch diameter are cumulative and include all errors of lead and angle.

TABLE 10—CLASS IIB, MEDIUM FIT, FOR NUTS OF THE FINE THREAD SERIES

TABLE TWO—DIMENSIONS OF THE FIRST THIRD SERIES										
Size	Threads Per Inch	Major Diameter			Pitch Diameter			Minor Diameter		
		Min. <sup>2</sup>	Tolerance	Max.	Min. <sup>1</sup>	Tolerance <sup>3</sup>	Max.	Min.	Tolerance	Max.
0	80	0.0609	0.0022	0.0631	0.0519	0.0013	0.0532	0.0465	0.0013	0.0478
1	72	0.0740	0.0023	0.0763	0.0640	0.0013	0.0655	0.0580	0.0015	0.0595
2	64	0.0871	0.0026	0.0897	0.0759	0.0014	0.0773	0.0691	0.0017	0.0708
3	56	0.1003	0.0028	0.1031	0.0874	0.0015	0.0889	0.0797	0.0019	0.0816
4	48	0.1135	0.0031	0.1166	0.0985	0.0016	0.1001	0.0894	0.0023	0.0917
5	44	0.1266	0.0033	0.1299	0.1102	0.0016	0.1118	0.1004	0.0025	0.1029
6	40	0.1398	0.0035	0.1433	0.1218	0.0017	0.1235	0.1109	0.0027	0.1136
8	36	0.1660	0.0038	0.1698	0.1460	0.0018	0.1478	0.1339	0.0030	0.1369
10	32	0.1923	0.0041	0.1964	0.1697	0.0019	0.1716	0.1562	0.0034	0.1596
12	28	0.2186	0.0048	0.2234	0.1928	0.0022	0.1950	0.1773	0.0039	0.1812
1/4	28	0.2526	0.0048	0.2574	0.2268	0.0022	0.2290	0.2113	0.0039	0.2152
1/2	24	0.3155	0.0054	0.3209	0.2854	0.0024	0.2878	0.2674	0.0045	0.2719
3/4	24	0.3780	0.0054	0.3834	0.3479	0.0024	0.3503	0.3299	0.0045	0.3344
1	20	0.4411	0.0062	0.4473	0.4050	0.0026	0.4076	0.3834	0.0054	0.3888
1 1/4	20	0.5036	0.0062	0.5098	0.4675	0.0026	0.4701	0.4450	0.0054	0.4512
1 1/2	18	0.5665	0.0070	0.5735	0.5264	0.0030	0.5294	0.5024	0.0060	0.5084
2	18	0.6290	0.0070	0.6360	0.5889	0.0030	0.5919	0.5649	0.0060	0.5709
2 1/2	16	0.7545	0.0077	0.7622	0.7094	0.0032	0.7126	0.6823	0.0068	0.6891
3	14	0.8802	0.0087	0.8889	0.8286	0.0036	0.8322	0.7977	0.0077	0.8054
3 1/2	14	0.9032	0.0087	0.9139	0.8546	0.0036	0.8572	0.8227	0.0077	0.8304
4	12	1.1310	0.0100	1.1410	1.0709	0.0040	1.0749	1.0348	0.0060	1.0438
4 1/2	12	1.2560	0.0100	1.2660	1.1959	0.0040	1.1999	1.1598	0.0090	1.1688
5	12	1.5060	0.0100	1.5160	1.4459	0.0040	1.4499	1.4098	0.0090	1.4198

**Composite Springs.**—Springs made of leaves (or plates), one or more of which are of alloy steel and the rest of carbon steel.

**Unsprung Weight.**—The total weight of all parts not supported on the springs, including axles, wheels, rims and tires complete.

**Rated Load.**—The load which the vehicle manufacturer specifies shall be carried by the springs at a given spring height.

**Load Clearance.**—The maximum distance through which a spring can travel beyond its rated load position, before striking.

**Load Height.**—The distance from a line through the center of the spring eyes to the face of the axle pad, when the spring is deflected to rated load.

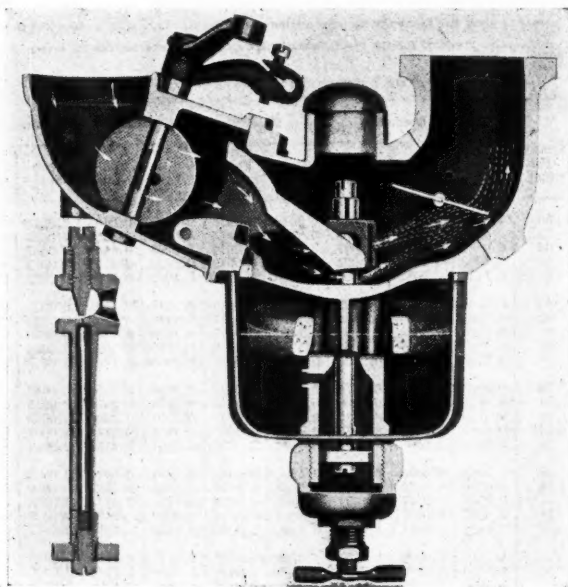
**Load Length.**—The distance between the centers of the spring eyes when the spring is deflected to rated load.

**Free Height.**—The distance from a line through the center of the spring eyes to the face of the axle pad, when the spring is in a free, unloaded position.

The Division recommends further that the present S.A.E. recommended practice for frame brackets for springs be cancelled.

## An Air-Shutter Type Carbureter

A SIMPLE type of carbureter which varies from certain more or less conventional types chiefly in the use of an interconnected air shutter and tapered meter-



Sectional views of Scoe carburetor showing detail of metering pin

ing pin is being produced by the Briscoe Devices Corp. under the name of Scoe.

The body of the carburetor is diecast and contains the shutter and metering device as well as the throttle and choke. The passage between the shutter and the lower wall of the air passage forms an approximation to a

venturi with its throat variable at a point adjacent to the nozzle, where the high velocity promotes atomization of the fuel. As the shutter rises, with increase in the quantity of air passing, the shutter opens and in so doing raises the tapered metering pin, thereby increasing the area of one fuel jet.

The metering pin is hollow and has near its upper end an orifice which can be partly covered by the flat end of a screw which controls the idling adjustment. Fuel which issues from this orifice enters the hollow stem of the pin through two small passages which are submerged in the fuel in the float chamber at light loads and idling. At higher speeds the lower hole is covered by the guide as the pin rises. The holes are of such size that the idling jet furnishes less and less fuel as the pin rises and the air flow increases, while the reverse is true of the jet, the size of which is controlled by the taper milled on the side of the metering pin. The latter can be given any desired slope, so that the mixture proportions for any given position of the pin can be varied as desired.

The carburetor is usually supplied with a metering pin, so shaped as to give a rich mixture for idling, a still richer mixture for low speed heavy pulling and acceleration, a lean mixture for the light load conditions of average running and a fairly rich mixture for maximum power at high speeds.

From the accompanying cut it will be noted that the metering pin is fitted at its lower end with a submerged disk, giving a dashpot action to prevent sudden change in position. The float is of laminated cork, coated with collodion and fitted with a valve of Monel metal. The metering pin is said to be the only element which requires close limits in machining, so that the cost of production is relatively low.

## Stanley Producing New Model

THE Stanley Motor Carriage Co. is now in production on a new model, to be known as Model 740, which embodies a number of changes in body and chassis and an increase of \$100 in the price of both open and closed types. Among the more important chassis changes may be mentioned an increase in boiler height of 4 in. with a consequent increase of 30 per cent in heating surface and 50 per cent in power storage capacity. The water level regulator is so set as to increase the normal height of water from 8 to 12 in. The rear axle is provided with a larger drive shaft and bearings and the wheels are secured with keys in place of the taper square formerly used. The area of braking surface has been increased 60 per cent, and condenser capacity about 8 per cent.

The throttle is now mounted so that it can be removed without disturbing the boiler cover and is operated by a lever arranged to give a more gradual opening than formerly. A number of improvements in the lubricating system have been made and a basket-type filter is now used in the fuel line. The main burner pressure system now includes but one tank, and its capacity is doubled.

Body lines are more pleasing and the car is lower hung, due to the use of 32 x 4½-in. tires, while the lower set top adds to the appearance. The new instrument board provides for a more compact location of the instruments and the barrel type head lamps are more rigidly mounted. Body models include 5 and 7-passenger phaetons, 2-passenger roadster, 7-passenger sedan and 4-passenger brougham.



# Truck Market in Brazil Expanding Rapidly

The vast natural resources as well as the leading products of the country need transportation to be utilized. Lack of transportation facilities has focused attention on the motor truck. More bus lines needed to supplement the street railways. Various projects are now under consideration.

By Floriano P. Santos\*

THE difficulties that were encountered a few years ago in introducing and fostering the motor truck in Brazil is now a thing of the past. The motor truck business has entered a new phase of development with brilliant prospects for its success. The factors most propitious to furthering the use of motor trucks are the increasing volume of Brazilian commerce and the general advancement of our industrial and commercial activities during the past few years.

The enormous riches, still untouched, that exist in the central part of western Brazil are known to most persons visiting our country. These resources cannot be exploited unless means of communication are established so that there may be suitable outlets to the east and west coasts of South America.

The mining industry demands better and more abundant means of transportation, to move the coal, manganese, gold and other minerals. The backbone of the Brazilian economic body, represented by the leading product, coffee, is handicapped, according to authoritative reports, to the extent of 40,000,000 pounds yearly, chiefly because of the lack of proper means of transport. This loss is reckoned at about 1,000,000 contos.

Our farmers and mining and business men, whether their holdings be large or small, are beginning to understand that railroads, as the only means of transportation, are insufficient. They are beginning to appreciate the efficiency of motor trucks as a modern substitute to the old-fashioned beasts of burden and wooden carts. The modern motor truck represents economical operation. It does not destroy the roads and it transports a larger volume of freight.

The great lack of transportation is a fact becoming known to all and it is realized more and more that the solution of the problem lies in the use of motor trucks, which are useful on the farms, in the rural districts, cities and almost everywhere. In Sao Paulo and Rio de Janeiro, the use of motor trucks has become generalized to such an extent that scarcely a commercial firm is found without one or more of these vehicles. They are used for delivery purposes as well as for general transportation, being mostly three-quarter or one-ton size.

The sale of small trucks of light weight is quite considerable. They operate at a smaller cost and comply with requirements for small loads. In the principal cities moving companies are using motor vans and there are numerous other uses to which they are being put.

In the interior several companies are engaged in the transportation of passengers and freight by means of

motor buses. Among the leading companies so engaged are the Barretos, Cantanduva, Rio Claro and Limeira companies in the state of Sao Paulo and the Cia. Auto Viacao Intermunicipal de Sul of Minas Geraes. In Santos, state of Sao Paulo, there is also a motor bus line, using 1-ton trucks, for the transportation of passengers from Ponte-Pencil to Forte da Praia Grande.

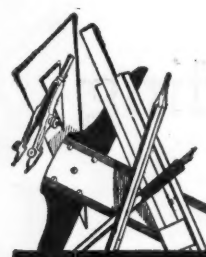
Notwithstanding the developments outlined, the motor truck business is now in its stage of evolution. It is being studied in all directions. Its outlook is promising and we are confident that its brilliant prospects will be materialized in the near future. The need of better and more abundant transportation is of utmost importance throughout the Republic and the answer is to use motor trucks.

At present there is under consideration a project to enlarge the city of Sao Paulo by utilizing vast stretches of land in the outskirts. These lands will be utilized for home building and the project should solve the housing shortage with which the city has been contending for the past few years. House construction on these properties would, of course, greatly increase the value of the real estate and the various towns which can be built within a short distance of the city would become prosperous if transportation were provided.

The street railway company cannot extend lines to the proposed towns, because of certain privileges already granted to some railroad companies, such as the Sao Paulo Railway Company, Estrada de Ferro Central do Brazil and Estrada de Ferro Sorocabana. Because of the fact that some of the best municipal highways and some fine private roads cut through the sites of these projected suburbs, the opportunity for using motorbuses is readily apparent. Several companies are organizing a project to institute the required bus lines.

It is probably advisable to organize several transportation lines. The first one probably should be that of Sao Bernardo, to cover the road from Sao Paulo to Alto da Serra, on the Sao Paulo-Santos highway. The initial capital required for the Sao Bernardo plan was estimated at Rs. 100,000,000 (about \$14,000 at current exchange), so as to provide the proper equipment, and reports on the proposal have been made to the interested persons. Offers have been made of free land for the installation of the company's establishment at Villa de Sao Bernardo and the proposal has aroused great enthusiasm among all persons interested in the development of these towns. It is confidently felt that the proposition will materialize soon and here there will be a great field for the application of motor trucks.

\*Sales manager of Dias, Carneiro & Cia, representatives for several American automotive lines at Sao Paulo, Brazil.



# The FORUM



## Research Necessary to Automotive Development

THE different types of research may be summarized as:

- (1) Scientific research.
- (2) Technical research.
- (3) Developmental research.

Any attempt to classify types of research reveals the fact that one merges into the other, and any division is a more or less arbitrary one. Nevertheless, there are distinct differences between the three types of research I have just mentioned. Scientific research in general deals with the search for knowledge for its own sake. The scientist likes to call it *pure* research. It is undertaken and carried on best by those whose only aim is the pursuit of knowledge without any hampering demand for its application, commercial or otherwise. It requires unlimited time and patience, and the spirit of the research worker.

Material rewards and physical comfort are usually of secondary importance to the man who accomplishes results in this line. He seldom cares to know whether his results are of direct material benefit to the race or not, being satisfied if the range of human knowledge is increased. Such men are the early discoverers and explorers of research; without them there could be no scientific progress, and the progress of industry would be confined to hopelessly narrow limits. Years or decades may elapse between the discoveries of Faraday, Maxwell and Hertz, and the commercial development of important processes, such as radio telephony, for instance, which would have been impossible without these discoveries. In fact, it is not always possible to discover who was the remote and obscure researcher whose diligent search for knowledge made possible some of our most important achievements.

It is not fair to say that scientific research alone is responsible for the difference between life in America today and in 1492, but it is fair to say that without scientific research this difference could not have been brought about. I particularly wish to emphasize this part of my subject because the importance, the necessity, for scientific research is not so readily appreciated as other lines. It is hard, sometimes, to see the forest for trees. It is easy for a business to stagnate and go bankrupt if the management confines its attention alone to the details of production and distribution, without developing its product or adopting new lines to meet changing conditions of

trade; in fact, stagnation is the certain result of lack of progressive thought, though the result may be long delayed.

Some few private institutions have had the courage to give generous support to purely scientific research, with the expectation of a return in dollars and cents. The investment in pure research has, however, been very amply justified in these cases; in fact, it has probably paid as well as any investment that the firms have made. Success of private companies in the research field requires the broad free policy which has been adopted by such

firms as the General Electric in connection with its work. The main general research laboratory at Schenectady has had the wisdom to allow freedom to the individual worker, to encourage him, and to avert discouragement.

It is true that, in conducting scientific research, the large companies have a very great advantage due to the fact that they are large. They can carry on a number of separate research problems with the expectation that some of them will yield results which will pay the cost of all. Such companies also have men and facilities which could not be assembled by the smaller companies. And perhaps even more important than this, they have the means for using

*DR. H. C. DICKINSON is probably better qualified than anyone else to discuss the matter of research from the standpoint of the automotive executive. He is now Director of Research for the Society of Automotive Engineers and was formerly Assistant Director of the Bureau of Standards. He has studied automotive research activities carefully both from the standpoint of the scientist and that of the business executive.*

*In this commentary on our recent Research Number, Dr. Dickinson describes in a brief, interesting manner, the relation of the various types of automotive research to business progress and profits. He has discussed this broad topic so definitely and concisely that every executive in the industry will want to read what he has to say.*

a very wide variety of results.

*Technical research*, as differentiated from pure research, is responsible for the great mass of information, technical and scientific, on which we have to rely for most of the answers to technical questions. It is this type of research which most directly concerns the engineer and the industrial plant. It requires men and facilities much the same as those for pure scientific research, but it has the added attraction, for some workers, of being directed toward some known and specific end. Technical research is a survey of the field of science and engineering. It affords a map of the territory, by which development can follow. The research laboratories of the various industries have been developed mainly for the purpose of covering this field, though there has been much confusion of ideas as to what constitutes technical research, and what developmental work.

In using the term research, I wish to limit it to the first two of the three types mentioned, viz.: scientific and technical. Developmental work is usually of an entirely different character; it demands men of a different type.



What is here termed research, scientific and technical, as distinguished from developmental work, implies a search for fundamental information of a more or less general character. The results can nearly always be expressed in equations or curves, and can be applied to conditions other than those under which they were obtained. For instance, the testing of an individual engine, a new design of manifold, or the trial of a new kind of fuel, without reference to the specific characteristics of them, would not constitute research in this sense, since the results would only be applicable under the original arbitrary conditions. On the other hand, tests of a series of manifolds differing in area or diameter or temperature, or tests of a series of fuels differing by definite amounts in some particular such as volatility, would constitute technical research because the results would be capable of showing, more or less accurately, a general relation, as for instance, the effect of fuel volatility on fuel consumption, a result of general applicability.

The distinction drawn here is a very important one, notwithstanding the fact that the two fields overlap to some extent, and as this distinction is very often missed in the discussion of research matters, I shall ask your patience while I attempt to make it clear.

Men and the lower animals share in common the ability to try things, and the process of trial and error has led to vastly the greater amount of our mechanical and social development. It is the time-honored process of evolution, which, if we accept Darwin rather than Bryan, has produced life on the earth as it exists to-day. Given infinite time and material and no cost of production, it is the surest process. It is an essential factor in all industrial developments and it has led, unaided, to many of the revolutionary discoveries in science. But it is not technical research. In fact, it has more place in scientific than in technical research. It is, however, the process which must be followed to a considerable extent in development work and invention. After having made use of the already known facts which have come through research, the only alternative is to try out something or turn to further technical research for fuller information.

What technical research has done for the engineer can perhaps be appreciated by simply considering what it would mean to design from the beginning almost any simple machine, without previous experience, or access to the published results of research, viz., the handbooks and tables. So much of this information is a heritage of the past that it is not always easy to realize how much technical research has given us in the ability to meet new engineering problems which would be hopelessly impossible otherwise. Technical research has given us what we have of available information.

But how far can we go in any line to-day without finding a serious gap in our information? I therefore wish to urge upon you the necessity for supporting and extending technical research laboratories of the various industrial plants and in the universities and technical schools as well. It is the main source of power to progress.

Any discussion of research must include the research worker. The two main incentives that actuate the research worker are a thirst for knowledge and the hope of economic progress. So far as the research worker himself is concerned, one can almost neglect the second incentive. A desire for knowledge for its own sake is almost the sole incentive of the individual who will devote his life to fundamental research. If the appeal of commercial success is strong, he will usually drift into invention or development where his research training will make for greater returns in money.

However, the most common incentive for the organiza-

tion and continued support of research laboratories or of any systematic research program is necessarily the commercial. In fact, this is almost the only one if we except some of the educational laboratories that have been endowed purely for the advancement of science. Thus, almost every research laboratory, particularly the industrial ones, presents a constant conflict between two viewpoints that are somewhat incompatible.

The true research worker is interested in securing facts and will not be satisfied until his results are complete. Moreover, every problem he undertakes presents to him numerous sidelines that are of absorbing interest. If given his own way, he will either carry through his problem to a final conclusion, or switch to some side line of greater interest, according to his temperament, unless he is endowed with unusual self-control.

On the other hand, the director of the laboratory or the capitalist who finances it will, as soon as some fact of apparent commercial value is developed, recommend dropping the research and developing something useful, unless endowed with unusual patience and foresight.

A happy medium between the two viewpoints is difficult to obtain, but a real compromise is necessary, since both viewpoints are important and neither side can be neglected.

I believe that the financial manager is coming more and more to realize that the search for knowledge affords the basis for all fundamental developments in the long run.

DR. H. C. DICKINSON.

## Dependence of Valve Stem Clearance on Cylinder Temperature

Editor, AUTOMOTIVE INDUSTRIES:

In reading Mr. Heldt's interesting article in your issue of May 25, it has occurred to me that there is an error in that part relating to valve clearances in air-cooled engines having relatively cool push rods. In such engines, as also in water-cooled engines with overhead valves and exposed push rods, the effect on valve clearance is actually opposite to that set forth in the article.

It appears that Mr. Heldt lost sight of the fact that the rocker arm pivot is raised an amount at least equal to the movement of the valve seat, so that the push rod end of the rocker arm is also raised and the clearance correspondingly increased.

It has been my experience, more especially with the Oakland and Buick, that the clearance increased with rise of engine temperature.

ROBERT F. KOHR.

The expansion of the cylinder alone, raising the valve seats and the valve rocker bracket, would produce an increase in the clearance equal to that expansion. This is reduced, however, by the expansion of the valve stem and the expansion of the tappet rod.

Inasmuch as the temperature of the tappet rod does not increase as much as the temperature of the cylinder walls—and the valve stem, although a part of it attains a higher temperature than the cylinder barrel, is comparatively short—the increase in the clearance due to the cylinder expansion is undoubtedly greater than the decrease in the clearance due to the expansion of the valve stem and tappet rod, so that the net clearance will actually increase with the cylinder temperature. In view of this fact it is rather surprising that the makers of a well known air-cooled engine recommend a valve clearance of 0.010 in. when the engine is cold.

For a very accurate determination the expansion of the rocker arm bracket also should be taken into account, which further increases the clearance, though very slightly only.

—Editor.

# Indirect Sales Costs Grow More Rapidly Than Volume of Business

Many factory activities are made necessary by the requirements of selling. Marketing expense should be charged with these costs. Because they are indirect, they tend to increase more rapidly than is justified by their usefulness. Unit selling costs should be determined from direct and indirect costs.

By Harry Tipper

**T**HE president of a large corporation holding a number of factories and distributing a great many products, was talking over his business problems the other evening. The burden of his conversation was the cost of distributing products and the difficulty of determining the validity of these costs.

It has been fairly easy to determine the validity of the manufacturing costs, although there is much confusion in the production end of the business as to the methods by which cost analysis shall be made.

Sales costs, however, have been determined in a very arbitrary way so that the practice does not agree between the different organizations in the same line of industry, and it is indeed a difficult matter to determine the validity of all the operations undertaken for the purpose of making and maintaining sales. This is true of the automobile business as of other lines. The problem is slightly more difficult in the automotive field because of the rapidity with which the business has grown and the difficulty of preparing a flexible system of analysis so that the costs can be determined and be properly placed in the departments of operation as they are required in the growth of the business. This lack of any basis for analysis of sales cost makes necessary a definition of "sales cost" before it is possible to examine those operations which enter into the maintenance and improvement of sales and the relative importance from a cost standpoint.

In preparing material for the New York University in the study of marketing costs, we laid down the general principle that manufacturing costs were completed when the goods were ready for shipment at the factory on railroad cars, and that all other costs accrued to the business from that point on, as costs involved in the marketing of the goods, the distribution of the product to the market, and the maintenance of the sales. This would provide three general departments of cost relating to the business:

1. **General Costs.** Those costs relating to overhead organization devoted to the business; not specifically devoted either to manufacturing or marketing.

2. **Manufacturing Costs.** Those costs entering into the production and fabrication of the product.

3. **Marketing Costs.** Those costs entering into the distribution and sale of the product.

For the purpose of this article, the consideration is limited to the third item. The distribution costs need

not be considered at this time. The discussion will be devoted to the operations entering into the sale of the product; the promotion of that sale; or the maintenance of the sale. These costs divide themselves into the direct costs of sale and the indirect costs.

The direct costs include the following general items of operation:

- Salesmen, Time and Expenses
- Branch Sales Office Expense
- Advertising Expense
- Sales Administration
- Service Organization Expense
- Office Departments of Sales and Sales Development

**C**AREFUL analysis of indirect marketing costs offer an excellent opportunity for increased efficiency and reduced selling expense. The fact that such costs are frequently carried under a general head makes it difficult to evaluate the activities which they represent.

Proper analysis of marketing costs requires that all activities made necessary by the requirements of sales effort be applied to distribution expense and that a unit selling cost be established for each vehicle which will take into consideration these indirect as well as the direct costs.

The indirect costs are:

- Office Operations Due to Sales
- Fixed Charges Required for Sales Organization Work
- Percentage of General Charges Due to Sales Organization Requirements

The direct charges have been more or less effectively determined with most establishments within the field. The relation between the salesmen's time and expense and the amount of business he does, is known effectively and the value of his operations is judged pretty carefully upon this relation. The branch sales office expense is determined in many organizations in relation to the total product activity of the territory covered by the branch, so that there is some fair knowledge of the value of the branch office in its operations in connection with the company.

In many cases, however, the branch sales office expense is not charged entirely to the sales work, because the necessary accounting, order department, shipping and



other departments not directly concerned with the sales, are frequently charged to the general departments in the main office governing those activities.

For instance, it has been customary in many firms to charge the branch office accounting to the general accounting department. This is not desirable because the branch office accounting expense is directly caused by the necessity for maintaining a contact with the immediate market and conducting the sales operations from a convenient central location. The accounting operations performed do not remove the work from the general accounting of the company. They simply add detail to that work for the purposes of sales operation. The advertising expense is known, of course, but it is frequently set up as a separate activity of the company, although the entire object of the advertising is to promote sales, stabilize the sales and develop the future of the market in connection with the product or the organization.

In the automotive field, particularly with the automobile or the truck which are transportation equipment—and useful, therefore, only as they are kept in operating shape—it has been necessary to devote a considerable amount of time and attention to the development of the proper service among retailers who are selling the cars. For this purpose separate departments of service have been erected at the factory with their constant touch with the distributors and retailers and their constant attempt to develop a higher type of service in contact with the user.

**F**OR the most part, these departments are charged to general administration or to some other general account of the company, although they are required because of the sales necessities and the effect upon the future market. Properly, the service organization expense should be considered as a part of the sales expense, as it is operated for the benefit of the future sales of the company, the stability of the market, and the development of it.

In order that the sales work may be conducted without confusion and with the necessary pressure upon the retailers and users, a great many additional operations are required within the branch and main offices of the company. These operations are necessary because of the sales, and they are valuable only as they permit the sales organization to function more accurately, more definitely, and with more speed in its development of the market.

In addition to these departments directly devoted to sales work, there are operations required in connection with the general departments of the company which are directly due to the activity and necessities of the sales organization. These operations should be carefully segregated and their costs charged to sales so that the sales burden may

be definitely established in connection with the organization requirements.

Finally, there are, of course, fixed charges due to the space occupied by the sales organization, the capital involved in preparing the equipment and space for them, and a percentage of the general charges necessitated by the organization of the company, which must be distributed according to the activities of the organization.

**T**HE indirect costs of selling, due to the activities within the offices of the organization, the extension of its fixed charges, the development of its routing, etc., have a tendency to grow more rapidly as the area of the market increases and the pressure upon the market develops. They have a tendency to grow more rapidly than the volume of business because they have only an indirect bearing upon the actual volume, and their value is more difficult to determine, while the departmental system of routine develops almost without respect to the volume of operations.

Furthermore, these indirect costs have not been studied in their relation to the sales effect, and they are usually classified under numerous headings so that they do not come before the executives of the company in their proper position and with their proper analysis. A study of the methods used in various organizations shows that very few of them have assembled all the expenses involved in sales under such a classification of accounts, and that very rarely, indeed, are the indirect costs, or even the direct organization costs, analyzed in connection with their effect upon the sales and their influence upon the sales development.

In many cases the direct cost of selling is only one-third, or less than one-half of the total cost of selling, while in some cases it is only one-fourth—the rest of the area being taken up with the indirect costs of organization due to the sales necessity. Engineers have understood for some time that the indirect costs of manufacturing were responsible for a larger expense than the direct labor costs, and were capable of a greater degree of improvement by analysis. The same thing is true in sales work. The direct costs should be thoroughly analyzed; but because they have been regularly analyzed they are usually more efficient and of less effect in connection with the total sales expense than the indirect costs which have been arbitrarily divided according to custom, without any real analysis.

The indirect costs offer an opportunity for improvement in efficiency, the elimination of a lot of useless system and motions, and the development of a better relation when they are so classified that they can be examined in their true relation to the sales development and their value in connection with such development.

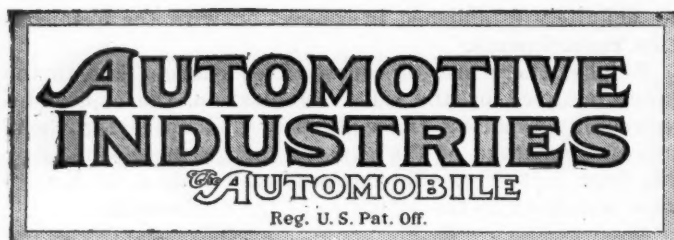
## Tests Prove Tractor Suitable for Winter Mail Delivery in Finland

**T**RACTORS and automobiles for the use of transportation of mail in Finland have been recognized by the government, and mail routes are now being established in remote sections of the country which have heretofore been almost entirely isolated. Automobiles are used in good weather, but a great deal of the winter weather makes the roads impassable and tractors have been resorted to, says a report to the Bureau of Foreign and Domestic Commerce.

A recent tractor-mail carrying test was made with a tank-model, track-laying tractor on the road between

Rovaniemi and Ivalo, a distance of 300 kilometers. Sleds laden with 11,000 kilos of mail and two sleds with official passengers were attached to the tractor. The tractor, it is stated, proved suitable for the purpose and surpassed expectations in spite of deep snow drifts, high hills and 40 degrees of cold. The trip consumed 4½ days.

Postal officials of Finland plan to establish several of these mail-tractor routes throughout the provinces of the country, and mail and passengers will both be transported.



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## Speed Limits

ATTENTION should be given to the absurd confusion of legislative restrictions hedging the operation of automotive apparatus in various states.

Wise regulation is necessary and has been fostered by the industry at all times. With the increased traffic on the highways these regulations should be stringent against offenders so that automotive travel is conducted with proper regard to safety of passengers and public. The present confusion in regulations does not make for safety. Many of them are so absurd that they are broken by nine-tenths of the drivers of vehicles.

These laws cannot be enforced regularly and are subject to sporadic attempts at regulation, working an injustice to the public and the drivers. Speed laws vary over ranges of limitation utterly absurd in the space of a single day's run. Village, town and city traffic rules change every few miles in many states. Cities with their converging traffic, insufficient street

space and cross streets require regulations and rules more restrictive than smaller centers. These again demand a greater degree of constant attention on the part of the driver and consequently a fair definition of rules. County districts do not need the same details of regulation nor the same limitation.

It should be possible to develop an orderly definition of the necessary regulations so that they would apply generally to the requirements of city, town and country travels. The increased simplicity would permit an orderly enforcement, and a full comprehension by the driver of his responsibilities in the case.

## Wages and Unit Costs

WE want to call special attention to the following statement received the other day from an important manufacturer.

"Wages in Detroit for automobile factory labor are up 10 to 15 per cent compared with three or four months ago. The costs of certain materials also show increases, while deliveries of materials in many instances are not as prompt as formerly.

"On its face it would seem that these developments would cut down the profits of automobile companies for the current period. This will not be true, however, except in a few cases, since these increases have been more than offset by the economy of augmented volume and improved productivity of labor.

"In the case of the Packard Motor Car Company, the costs of materials purchased represents almost half the price of a Packard product, but the reductions in unit costs attained in the items making up the other half have resulted in total unit costs remaining practically the same as before the rising material markets."

This statement of an actual condition within an automotive factory furnishes an excellent example of how an intelligent analysis can give a proper perspective in viewing manufacturing and price problems. The fluctuation in wages is only one phase of manufacturing cost, often a comparatively small one.

The important figure is not the actual wage scale, but the unit production cost. If increased wages were found to result in decreased unit costs, the increase of wage scales would be an economical action to take.

A more careful consideration of the relative value of the factors affecting unit costs is needed. A general view of the situation frequently fails to give the proper weight to the various factors. Some managements have even been known to insist that if wages went up 10 per cent the cost of the product would naturally have to go up 10 per cent.

The individual performance of the workmen in a factory has a strong bearing upon the unit production cost. Comparatively little is known at the present time about the relative effect of wages, working conditions, monotony jobs, promotion possibilities, etc., upon the efficiency and stability of the individual.

As illustrated by the manufacturers' statement given here, the apparently obvious conclusion that might be drawn from a superficial consideration of the matter very rarely coincides with the actual facts



as developed from a closer investigation and analysis of methods and production costs.

## Productivity, the Measure

**R**ELATIONSHIP between factory and selling organizations is a difficult thing to maintain properly. Close supervision through a personal contact is often expensive for a factory and onerous to the supervised. The goal to strive for is maximum co-operation with minimum actual supervision.

One of the reasons given by passenger car manufacturers for abandoning branches in favor of other forms of organization is that there is a tendency for the branch to rely on the factory to make good its losses, to use a slang phrase, "to pass the buck to the factory." This attitude does not make for maximum initiative on the part of the branches.

Most manufacturers who operate branches have avoided this by putting the responsibility up to the branches to stand on their own feet and at the same time create feeling that the factory and branches are one. This is done by giving the maximum of responsibility, and the profit to the individuals in the branch is dependent on their performance.

One of the difficulties in determining the measure of success of a branch or other form of selling organization is that the standard of performance is set arbitrarily which permits question as to its accuracy.

Market analysis can assist in setting a standard which leaves little question of accuracy. If actual demand is known and recognized, it remains for the branch to produce and the amount of individual responsibility granted by the factory can be indefinite if based on this standard.

## New Ways to Finance Highways

**H**IGHWAY construction is going to be put on a business basis. Leaders in the automotive industry are already taking an active part in the effort to find out how much highways really cost, what returns they give to users and to the public, and how the cost of construction and maintenance can fairly and economically be distributed among the various interested parties.

The time has passed when highway construction was chiefly a concern of politicians. "Highways must be made self-supporting," said Chief MacDonald of the Bureau of Public Roads, recently.

Many factors must be investigated to achieve this end. Transportation costs will have to be studied further, the relation of various kinds of vehicles to various types of road will have to be determined, and the type of highway needed for the economic purposes of a given community will have to be examined more carefully. Highway construction will go forward in the meantime. Highway financing will continue. The best methods available must be used.

Robert M. Haig has recently put forward a logical economic argument for the financing of highways by means of long term bonds. Quoting Chief MacDonald, Haig shows that the foundation of a highway can be made permanent; can be so constructed that it

will improve with age. Thus a part of this foundation cost can be passed on to the next generation.

Maintenance will have to be re-defined, however, if this method is used. Maintenance will have to include not merely day-to-day expense of keeping the highway in serviceable condition, but also the replacing of the surface when needed.

Representatives of the American Association of State Highway Officials, the National Automobile Chamber of Commerce and the Bureau of Public Roads met in Washington at the Federal Bureau May 24 to discuss important matters relating to highways and highway transport. The meeting was the first of a series which, it is expected, will eventually lead to conclusions which will have an important bearing on legislation relative to these subjects.

Far-sighted executives throughout the automotive industry are keenly aware of the practical importance of a scientific and proper solution of the growing highway problem. Trouble may not accrue immediately to the industry from a failure to solve highway problems effectively, but the effect upon motor car and truck sales will be very great in the future. The efforts of those representatives of the industry who are applying themselves to a solution of highway problems should have the support of other executives.

## A Truck Load Capacity Rating Formula

**T**HERE are evidences that the possibility of establishing a standard truck formula are being discussed again. From an engineering standpoint there are many difficulties involved but the advantages to be derived from a marketing and taxation standpoint make it worth while to spend the time necessary to overcome the obstacles.

Recent surveys have proved the prevalence of overloading trucks, a practice which in the long run redounds to the detriment of truck sales. Overloading is partly done with a full knowledge of the circumstances, but variation in meaning of truck ratings tends to encourage rather than discourage the practice.

Nearly every state in the Union is studying the matter of regulation and taxation of trucks. Some rules are necessary, but they should be such as to encourage transportation in its most economical form. To attain such regulations, the truck manufacturer should co-operate with state officials in every possible way, that the problems of truck transportation may be worked out in the way that will be mutually beneficial to all concerned. The determination of a standard method of truck rating is one effective means of effecting such co-operation.

The engineering difficulties on the way of determining a standard truck rating formula should not be allowed to prevent the adoption of some standard. The chief need is for a uniformity in method of rating, whether that uniformity be entirely in accord with scientific engineering or not. The N. A. C. C. horsepower rating is a useful tool, but it does not conform to the requirements of technical and refined engineering terminology.

# Durant's Bid Gets Elizabeth Plant

## \$5,525,000 Offered in Field of Three

**Maxwell Motors Drops Out at  
\$5,500,000—Star to be  
Made There**

NEW YORK, June 12—Durant Motors, Inc., bid in the huge new plant of the Willys Corp. at Elizabeth, N. J., for \$5,525,000 when it was offered at receivers' sale last Friday. James Smith, Jr., representing Walter P. Chrysler and the Maxwell Motor Corp., dropped out at \$5,500,000.

Dramatic scenes attended the auction, which had been expected to be a perfunctory affair. Durant had announced previously that he would not bid a nickel more than he had previously offered the receivers for the property, which was approximately \$3,000,000, and it had been expected there would be no other bidders.

Before the sale opened, however, certified checks for \$200,000, a prerequisite to making bids, had been filed by Joseph P. Day, a New York real estate expert, representing Durant, by Smith and by J. Clarence Davies, a New York auctioneer, who declared he represented no one but himself. It was reported that he represented Studebaker interests. Davies dropped out at \$4,000,000.

The property was offered first in four parcels. One of them included the plant equipment and machinery and another the land and buildings. When it was found that the highest bids for the four parcels aggregated only \$3,030,000, it was decided to offer the property as a whole.

### Offers Rise Steadily

It was then that the excitement began. The first bid was \$4,000,000 under this plan. As the offers rose steadily higher, from \$5,000 to \$100,000 at a time, excitement became intense among the 500 or 600 spectators. Each new bid was received with cheers. Many of those who attended the auction held mechanics' liens on the property, and they realized that the higher the bid the more they would receive for their claims.

Smith finally raised his offer to \$5,500,000. When Day raised him \$25,000, Smith bowed, smiled and retired. There were no more offers, and the property was declared sold to Durant. Frank P. Kennison and Francis G. Caffey, receivers, attended the sale, which is subject to confirmation by the Federal court. It is considered improbable that there will be any objections to accepting the bid of Durant, which was more than had been expected, and it approximates 50 per cent of the cost of the property.

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## Business in Brief

NEW YORK, June 12—Continued gains by trade and industry have been reported in the last week.

Orders now on the books of steel companies indicate that operations will be continued at the present rate for at least three months. This will carry them over the dull season. Some western mills are not disposed to book freely for deferred delivery.

Building construction has taken another surge forward.

Factory activities in shoe and leather making have been increased in the East and some western plants are working at capacity.

Crop reports have improved, especially those relating to the big surplus food staples.

Retail trade is better, and there is a greater disposition to buy for the future.

For each of the four weeks ending with May 21, the number of freight cars loaded with commodities other than coal was larger than for the corresponding week of any other year since car loading statistics have been compiled.

Up to June 3 the railroads of the country had ordered approximately 80,000 new freight cars, or about three times the total purchased in all of 1921. It is expected that by the end of June the total will have reached 95,000.

Stocks are less active, bonds generally firm, money easier and sterling at a new high.

Bank clearings for the week ending June 8 aggregated \$7,304,687,000, a gain of 22.1 per cent over the previous week, which included a holiday, and of 18.7 per cent over the same week last year.

The coal strike, a threatened rail strike and other labor difficulties constitute the only important unfavorable factors in the industrial situation.

### COLLECT PRIVILEGE RESTORED

NEW YORK, June 12—The American Railway Express will rescind on June 15 its rule requiring the prepayment on charges of shipments to Canada and restore the collect privilege. After that date shippers can send their goods prepaid or collect, as they prefer. The rule was put into effect because of the high rate of exchange between the United States and Canada, but improved financial conditions have brought the discount rate to approximately 1½ per cent.

## Maxwell Had Plans for Chrysler Six

**Rights to Design of Car Pass to  
Durant as Result of Sale  
Plant Built for It**

NEW YORK, June 13—If the Maxwell Motor Corp. had been successful in its bid for the Elizabeth plant of the Willys Corp., for which it offered \$5,500,000, it would have used the factory for the production of the Chrysler six, the purpose for which it was built.

Failing to get the property for what it considered a fair price, the corporation is not likely to take up any new building projects for several months at least, although it is probable it ultimately will establish a plant on the Eastern seaboard. Nothing will be done in this direction, however, until the return from Europe of Walter P. Chrysler, chairman of the board, the middle of September.

The Maxwell company is in an unexpectedly strong cash position, and Chrysler believed it would have been profitable to take on the Chrysler six, with which he is thoroughly familiar, in addition to the Maxwell and Chalmers lines. Rights to the designs for the Chrysler six went to W. C. Durant when he made the highest bid for the entire property. Lacking a suitable factory, it is said to be unlikely that the Maxwell interests will offer to buy these rights from Durant.

The Elizabeth plant was built under the direction of Chrysler while he was executive vice-president of the Willys enterprises, and the bankers who have lent their support to Maxwell were willing to back him in a new enterprise because they have a very deep regard for his ability as a production man and executive.

### Chrysler Sails for Europe

NEW YORK, June 14—Walter P. Chrysler, chairman of the board of the Maxwell Motor Corp., sailed yesterday on the Aquitania for a three months' tour of Europe. He was accompanied by Mrs. Chrysler and their two daughters. His trip abroad will be devoted almost entirely to pleasure and it will constitute the much needed and long deferred vacation which he promised himself when he retired from the Willys enterprises.

The Chryslers will visit France, Switzerland, Italy, Austria, Czecho-Slovakia, Germany, Belgium, Holland, Paris and London, sailing for home September 9. While in Germany they will go to Oberammergau to witness the Passion Play.

Chrysler deferred his vacation until after the graduation of his elder daughter

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# Lelands Quit Lincoln Organization

## Company Operating as Ford Subsidiary

### New Production Methods at Factory Said to Have Caused Disagreement

DETROIT, June 13—The retirement of the Lelands, Henry M. and Wilfred C., as president and vice-president and general manager of the Lincoln Motor Co., with the complete assimilation of that company as a Ford subsidiary, were considered accomplished facts in Detroit to-day. While no authoritative statement on the situation was obtainable either from Ford or Leland sources, when Henry M. Leland was questioned at his home as to the reported retirement of himself and his son he made this enigmatic statement:

"Something along that line is pending and it will be consummated within 24 hours."

#### Emmons Makes Statement

Harold H. Emmons, the attorney who represented the Fords in the purchase of the Lincoln plant at receivers sale, and who also has been personal counsel for the Lelands and for the Lincoln Motor Co., issued a statement relative to the situation, which he said he made as an attorney in Lincoln matters. The statement said:

Following its purchase in February by the Ford Motor Co., the Lincoln Motor Co. entered into a period of great activity during which the demand for the Lincoln car has been unprecedented. Its performance, together with assistance of continued and increased production, has resulted in an overwhelming demand for this automobile which has grown to such proportions that it is entirely beyond the production capacity of the present plant.

A readjustment of manufacturing facilities and relationship thereupon has become necessary in order to secure to this enterprise the complete assistance of the enormous Ford resources. To accomplish this result a combination of the executive administrative and manufacturing departments is in process out of which there will be a realignment of relationships. The management and conduct of the business will be transferred from Henry M. and Wilfred C. Leland to the combined Ford and Lincoln organization and under the control of Ford executives.

#### Disagree with Methods

While nothing official has been said, it is understood that the Lelands' retirement is due largely to their unwillingness to conform to Ford production methods. Although nominally vested with the control of the plant following the Ford purchase, there has been much realignment of facilities and methods, which did not meet their approval.

## Most Important Result of Renewed Buying Is Change in Attitude of Banker

By ALVAN MACAULEY

President of the Packard Motor Car Co.

Detroit, June 12.

**B**USINESS in the automotive industry gives every indication of carrying through the summer months on a scale closely approximating the present large demand, and in my estimation will be good right up to the winter season. Though the business for the year thus far has been much heavier than it was possible for manufacturers to estimate, it is most likely due to the fact that there has been a stemmed-up buying tendency for some time past and owners have now come to the conclusion that this is the time to buy new cars.

The old car was compelled to give service beyond the time that would have been expected of it had business conditions been improved during the past two years. Business is now better and will get better as the year advances. This will all be favorable to a continuation of the present buying movement that the industry is enjoying.

I believe that the most important result that the automobile buying of this year has accomplished is to change the attitude of the banker toward the industry.

There has long been a tendency by bankers to consider the automotive industry as a game rather than as a stabilized, essential business. The demand this year has shown the banker that the automobile is an essential, and the success of the industry has been mainly important in reviving business in what have been considered the basic industries.

The steel mills to-day are receiving a large volume of their business from automobile manufacturers. There is some delay in getting steel shipments but there is no shortage, nor is there any shortage in other commodities necessary to the manufacture of cars, except that time is required in getting them. This is all due to the fact that automobile buying has been beyond expectations and it has been impossible to prepare for it on a scale that later conditions justified.

There is a growing tendency toward the use of closed cars, Packard business at the present time in these models exceeding open model business. I believe that this condition will be true generally in the automobile business within a short time, and is now largely the case in better class cars. Buyers with \$2,500 to \$3,000 to spend are taking a closed car in a lower class car rather than an open model in a better grade. Touring models will wane until they will be confined largely to suburban use and for traveling. There is a waning desire for seven passenger touring models and those being bought now are for the extra room afforded rather than for the actual accommodation of seven passengers.

Two weeks ago, with the removal of the Lincoln purchasing department to the Ford Highland Park plant and the changing of the Ford sales department to the Lincoln plant, there was threatened a severance of relations. Edsel Ford is said at that time to have removed the Lelands from authority, but reinstated them almost immediately.

In the four months that the Lelands have conducted the plant under Ford ownership, there has been great difficulty in reaching a production basis that would be at all proportionate to the orders that the company received. At present, production is about 30 daily, having reached that point from an output of about 15 daily at the time of the sale. The company has claimed that it was handicapped through shortage of materials, but it is known that production methods were un-

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## Texas Plans Prohibitive Taxes on Bus and Truck

FORT WORTH, TEX., June 9—A keen fight is in prospect, before the forthcoming session of the Texas Legislature, over a tax on motor trucks engaged in commercial traffic, and on buses operated for profit.

Legislation, levying almost a prohibitive tax on these two classes of vehicles, has been drafted, it is reported, and will be offered to the lawmaking body.

Steam transportation lines are said to be behind the move, which, if successful, will stop the use of the trucks for freight carrying between towns and drive out the buses, insofar as passenger travel is concerned.

In the last year, each of these has gained in popularity and in general use in Texas.

## Factories Forcing Big June Schedule

Operating at Full Speed to Meet  
Demand—No Reserve  
Stocks Accumulated

By JAMES DALTON

NEW YORK, June 9—Even the leading factors in the production of automobiles have been astounded at the aggregate output of 252,000 passenger cars and trucks in May, which exceeded the highest previous mark by 32,000. This total may be enlarged when complete figures are available. All factories have swung into June at full speed and are forcing production to keep pace with demand. It has been impossible to accumulate reserve stocks of passenger cars.

### Many Manufacturing Problems

Although the industry naturally is gratified that it is operating at capacity, the pace is so swift that it has resulted in many manufacturing problems which would not have become important with a somewhat smaller output. These various factors, none of which is particularly serious in itself, have combined to increase costs considerably.

Stock chasers, shipments of parts by express, orders by telegraph and premiums for raw materials, all cost money and add to the expense of turning out motor vehicles on which the profit is much smaller than it was before the era of keen competition forced by business depression. Prices of parts are somewhat stronger because the parts manufacturer, lacking long term commitments, has to buy in comparatively small quantities and pay stiffer prices than otherwise would be required.

Many automobiles are being shipped from Detroit lacking minor parts. When the parts are received at the factories from the makers, they are shipped by express to distributors and the cars are equipped in the service stations of dealers and distributors. By resorting to this plan shipping delays have been cut down.

### Has Price Stabilization Effect

While the cumulative effect undoubtedly has been to increase production costs, it has had a stabilizing effect on retail prices and few revisions are in prospect except perhaps in the truck field where the return to normal conditions has not been completed. While there is no likelihood of further recessions in passenger car prices it is equally unlikely that there will be any general increases. Whatever upward trend may become apparent will

## "FLIVVERBOOB" WINS IN A. A. A. CONTEST

WASHINGTON, June 12—Reckless and careless drivers of automobiles are to be known as "flivverboobs," according to the decision reached by the judges deciding the American Automobile Association's contest to pick a name describing the reckless driver in the same manner that "jay-walker" describes the careless pedestrian.

The name was suggested by F. B. Simpson, of Cedar Rapids, Iowa, who will receive the \$25 in gold offered as a prize by the A. A. A. More than 10,000 names were submitted in this contest, and the suggestions came from all parts of the United States.

be caused by the necessity of returning a profit in the face of mounting manufacturing costs.

The most popular topic of discussion within the industry is the outlook for the remainder of the year. It is not to be denied that it is exceedingly bright at this time. There is not the slightest sign of a falling off in demand for June and it promises to be one of the big months of the year.

While it is the general expectation that July will bring a slowing up in sales, the volume of business will depend largely upon the farm market. There is every reason to believe there will be a heavy demand in the agricultural districts as soon as the harvest is well under way, which will be not later than July 15 in most sections.

## Ford Buys New Orleans Site for Assembly Plant

DETROIT, June 10—Ford Motor Co. has closed a deal for ten acres of land on the Mississippi river, on the outskirts of New Orleans, where an assembly plant to build 150 cars daily will be erected. The plant will serve the southern half of Louisiana, Texas and a part of Mississippi. It is planned later to develop the plant to take care of shipments to Mexico and some South American countries.

Edsel Ford, president of the company, said the total outlay on the new plant will be \$400,000, including the land, which represents a valuation of \$80,000. Four hundred men will be employed at the outset.

Freight rates have an important part in determining the field to be covered by each assembly branch, Edsel Ford said, and will be studied thoroughly before the final territorial limits of the new assembly plant are established. In addition to the river frontage of the plant, it is served by the Illinois Central railroad.

## Bumper Patent Suit Decision Given Cox

Pancoast and Grotenhuis In-  
fringement Charged by  
American Chain Co.

CLEVELAND, June 12—Judge D. C. Westenhaver has handed down a decision in the Federal district court dismissing the complaint in the suit brought by the American Chain Co. against the Cox Brass Manufacturing Co. of Albany, N. Y., alleging infringement of the Pancoast and Grotenhuis bumper patent No. 1,374,893.

The chain company announced that an appeal would be carried as rapidly as possible to the United States Circuit Court of Appeals at Cincinnati.

The plaintiff asked for an injunction, contending that the Pancoast and Grotenhuis bumper made by the defendant under its patent No. 1,371,605 was an infringement of the Bi-Flex bumper controlled by the chain company and under which licenses had been issued by that company to several manufacturers.

The defense of the Cox company was based upon the ground that the Pancoast and Grotenhuis patent was invalid for want of an invention; that it was invalid because it contained a needless multiplicity of nebulous and indefinite claims calculated to mislead and deceive the public and that the invention was sole and not joint.

This contention was upheld in part by Judge Westenhaver, but the chain company contends that inasmuch as there existed for many years a widely recognized need for a device performing the functions and giving the protection of a centrally broadened bumper and engineers and manufacturers tried unsuccessfully to solve the problem, the working out of a practical device like the Bi-Flex bumper, which was widely adopted by licensees and competitors was not an obvious slip, but involved study, experiment, intuition and genius, which amounts to invention.

## Goodyear Workers Ask for Increased Wages

AKRON, June 12—Following voluntary 10 per cent wage and salary increases granted to employees of the Firestone Tire & Rubber Co., the house and senate of the Goodyear industrial assembly, composed of men elected from the ranks of labor by their fellow workers under the Goodyear plan of democratizing industry, have unanimously adopted resolutions asking the company to grant a 12½ per cent salary increase and 10 per cent wage increase, effective June 15.

So far the company has taken no official cognizance of the resolution presented by the industrial legislators to Vice-President and Factory Manager Paul W. Litchfield, and no announcement has been made as to whether the company contemplates any wage adjustments.



## Lists 8 Companies in Plan for Merger

### Two Not Heretofore Mentioned Are Announced by Associated Motor Industries

LOUISVILLE, KY., June 12—Plans for an annual manufacture of 15,000 automobiles and 40,000 wagons at the Kentucky Wagon Manufacturing Co.'s plant were disclosed Saturday when James R. Duffin, attorney for the company, asked until June 26 to file a response to bankruptcy proceedings against the company instituted in the Federal district court.

The Kentucky Wagon company is one of the eight concerns which will become a part of the Associated Motor Industries, it was stated.

Helm Bruce, attorney for L. B. Lewis, who holds a claim in the state court for \$55,000 against the company, objected to the continuance which was sought from Judge Walter Evans pending a reorganization of the company's affairs. Bruce stated that his client did not wish to enter the consolidation.

#### Injunction Previously Sought

Several weeks ago the Federal court was asked for an injunction against the state court, asking that further action against the Kentucky Wagon company be deferred until it had time to formulate plans. No objection to the continuance was made by D. A. Sachs, Jr., or Emile Steinfeld, attorneys for the petitioning creditors.

Details of the Associated Motor Industries financing are contained in a circular issued by the Union Trust Co. of Chicago, to advertise a \$6,000,000 issue of the company's bonds. The bond issue is to be of first mortgage 10 year gold bonds, paying 7½ per cent to be retired from a sinking fund for which provision is made.

The companies named as having been consolidated, in addition to the Kentucky Wagon Manufacturing Co., are the National Motor Car & Vehicle Corp. of Indianapolis, the Traffic Motor Truck Corp. of St. Louis, the Recording & Computing Machines Co. of Dayton, the Covert Gear Co. of Lockport, N. Y.; the Jackson Motor Corp. of Jackson, Mich.; the Saginaw Sheet Metal Works of Saginaw, Mich., and the M & T Corp. of Boston. The Associated Motor Industries was incorporated in September, 1921, in Delaware.

#### "National" to Be Used for Cars

The consolidated company will manufacture a line of passenger automobiles, it is stated, consisting of "fours, sixes and de luxe sixes" under the trade name "National" and the production of trucks, ranging from one to three and one-half tons capacity, under the trade name "Traffic trucks."

The various properties consolidated to form the company, it is pointed out, permit economy of production and insure a uniform quality in workmanship and ma-

## PAPERS SEEK TO KEEP LABOR IN OWN CITIES

PITTSBURGH, June 12—As an indication of the present shortage of skilled labor, the Standard Motor Car Co. reports that newspapers in several cities, which were requested to run advertisements calling for high class workmen who specialize in automobile body and engine work, declined the copy on the ground that manufacturers in their own towns were so severely pressed for workers that it would be against the best interests of their city to run the advertising and manifestly unfair to local industry.

The Standard company is working overtime in an attempt to meet the demand for its line.

terial. The issue of bonds, it is declared, is for the sole purpose of providing additional working capital for extensions and betterments.

The bond issue is to be secured by a direct closed first mortgage on the fixed assets of the company. These, according to the circular, amount to \$19,816,448.46 or \$2,970.61 for each \$1,000 bond to be issued. This includes current assets of \$1,682.26 for each \$1,000 bond, it is said, and land, buildings and machinery of \$1,288.35 for each \$1,000 bond.

Provision is made for the retirement of the bonds by a clause in the trust deed stipulating that there must be an annual sinking fund of not less than \$500,000 a year, which must be applied solely to the redemption of the first mortgage bonds. The issue is to be dated June 15, 1922, and is expected to be ready for delivery June 20.

#### Jackson and Traffic Assets Transferred

NEW YORK, June 12—Announcement at Louisville of the companies which are to be included in Associated Motors occasioned little surprise here. Only two of them have not been previously mentioned in this connection. They are the Saginaw Metal Works and the M & T Corp. of Boston.

The only corporations whose assets have been actually transferred up to this time are the Jackson Motor Corp. and the Traffic Motor Truck Corp.

Stockholders of the National Motor Car & Vehicle Corp. will hold a special meeting in this city next week to determine whether to accept the offer of Associated Motor Industries.

It has been understood that several other companies would be taken into the merger, and a large number have been mentioned in this connection.

#### 10 PER CENT NEW OWNERS

SYRACUSE, June 12—The Franklin Automobile Co. reports that a notable feature of its business is the number of cars being delivered to persons who are buying a car for the first time. The proportion runs as high as 10 per cent.

## Fisher Body to Pay \$1,000,000 Dividends

### Payment Includes 8 Per Cent Accrued in Addition to Reg- ular Quarterly 2 Per Cent

CLEVELAND, June 12—With business transacted in the first year of operations exceeding the predictions of officers of the corporation, the Fisher Body Ohio Co. is about to forward to preferred stockholders dividends aggregating \$1,000,000.

The big distribution is to be made July 1 as a result of the action of directors in declaring an 8 per cent back dividend in addition to the regular dividend of 2 per cent for the quarter ending June 30.

The fiscal year of the company ended May 1, and the annual earnings are now running at the rate of \$22,000,000 to \$24,000,000.

The company is now delivering from the plant 320 bodies a day, and of these 270 are closed.

The dividend that is going to preferred stockholders on July 1 is in accordance with the promise of the parent company to clean up the dividends that accrued pending the time the Cleveland plant was getting under way.

#### Good Chandler Reports

F. C. Chandler, president of the Chandler Motor Car Co., after directors of the corporation had met in quarterly session, stated that business for the five months ending May 31, indicates that the full year's dividend requirements of \$6 a share will be covered by the first half's earnings.

At the White Co. plant more than 3000 men are employed, compared to 2000 at the beginning of the year. Walter C. White, president, stated that orders in May exceeded the one thousand mark, and deliveries showed a substantial increase over April, with every indication of a total business for the year of approximately 9000 trucks.

The earnings for the past two months has been at a rate more than sufficient to meet the regular dividend requirements. Loans have been cut down to \$1,700,000, with no customers' notes discounted, as against \$3,600,000 on Dec. 31, 1921, and cash has increased in the same period over \$1,250,000.

The company has declared the regular quarterly dividend of \$1 per share payable June 20 to stockholders of record at the close of business June 20.

#### CONSIDER BUYING PARENTI

YOUNGSTOWN, OHIO, June 12—Western Pennsylvania stockholders of Parenti Motor Co. at an initial meeting at Sharon, Pa., gathered the nucleus of a fund to be used to buy and operate the company's Buffalo plant. The Parenti Motor Co. is in receivership. A further meeting of stockholders to promote the purchase project will be called for Buffalo.

## Conservatism Urged At N. A. C. C. Meeting

Colonel Clifton, Re-elected President, Sounds Note of Warning to Members

NEW YORK, June 12—A note of warning that this is a time for conservative thinking and planning in the automotive industry was sounded by Colonel Charles Clifton, president of the National Automobile Chamber of Commerce, at the annual members' meeting held last week. His address made a deep impression on the 100 or more manufacturers who heard him, and many of them declared their views coincided with those of Colonel Clifton.

In his address, Colonel Clifton called attention to production figures covering a 10 year period and used them to demonstrate there has been a very definite trend in production and sales in certain quarters of the year. He showed that the present unprecedented production merely is taking care of the demand which was dammed up during the depression of last year, together with the normal return this year. He called attention to the statement made recently in *AUTOMOTIVE INDUSTRIES* that sales at this time are no larger than they would have been if there had been no war.

### Sees Normal Curve Rest of Year

If this contention is true, Colonel Clifton said, there should be a normal sales curve for the remainder of this year with the usual seasonal decline beginning about July 1. Business is so good that it preaches conservatism, he declared. Retail demand rises from three to six months in advance of production, and the curve of retail sales declines about the same length of time ahead of production.

Colonel Clifton said that the last six months of the year probably would be better than the seasonal curve might indicate because of increasing demand for closed jobs which is heavier in the fall than at any other time of the year.

Asserting that he would not sell the automotive industry short at any time or under any circumstances, Colonel Clifton said he believed this was a time for conservative planning and thinking so that the manufacturers might not get into a position which would be harmful to themselves, their suppliers and their dealers.

### Members Enthusiastic

The members who attended the meeting were enthusiastic about business conditions and were virtually unanimous in asserting that their factories were operating at capacity. There was considerable discussion concerning the outlook for the remainder of the year, and it was generally believed that, while a seasonal mid-summer decline is probable, there will be nothing in the nature of a slump and that the last half of the year will be considerably better than the same

period of 1921, when production aggregated about 850,000.

Considerable attention was given to reports on retail sales of automotive products in practically all sections of the country, and much gratification was expressed over the fact that reports from North Dakota and South Dakota were optimistic for the first time in 20 months.

Julius H. Barnes, president of the Chamber of Commerce of the United States, who also spoke, predicted prompt revival of business with a resulting increase in motor transport. He cited as one reason why the United States can invest so heavily in motor vehicles the fact that the average American family has to pay out only 40 per cent of its income for food, as compared with 60 per cent paid by the average European.

### He Spoke of Conditions in Russia

"If in America the otherwise necessary expansion of railroads has been checked and replaced by the development of motor transport, and if in the test of competition motor transport justifies itself against the steam railroad in new areas," he declared, "then Russia with its 200,000,000 people and its vast distances and its scanty railroad lines, offers a great field for motor development."

The members voted for a continuance of all the activities which the N. A. C. C. has carried on, notwithstanding the fact that it may mean further inroads upon the surplus in the treasury of the organization. There was a heavy deficit last year.

The following directors, whose turns had expired, were re-elected: Roy D. Chapin (Hudson), C. C. Hanch (Lexington), J. Walter Drake (Hupp), H. H. Rice (Cadillac) and John N. Willys (Willys-Overland).

### Clifton Re-elected President

At the subsequent organization meeting of the directors, Colonel Clifton was unanimously re-elected for another term as president. Other officers elected were: vice-president, Roy D. Chapin; second vice-president for passenger car division, C. C. Hanch; second vice-president for motor truck division, Windsor T. White; secretary, A. J. Brosseau; treasurer, H. H. Rice; general manager, Alfred Reeves.

The motor truck members held a meeting of their own in the afternoon at which they listened to a discussion of problems peculiar to their own field. The principal speaker was Daniel L. Turner, consulting engineer of the Transit Commission of New York City, who discussed "The Auto Bus in the New York Transit Plan."

### GOODYEAR ABSORBS WAR TAX

NEW YORK, June 9—Goodyear Tire & Rubber Co. announces a reduction of 5 per cent on tires to its dealers. While prices hereafter will be quoted to the consumer at net, the dealer will continue to pay the old 5 per cent war tax, but this will be offset by the reduction of that amount allowed by the company. This means virtually that the company is absorbing the tax.

## Tire Surplus Danger Seen by Firestone

Executive Declares That Schedules Now Maintained Indicate Over-Production

AKRON, June 12—Despite the fact that the current demand for automobile tires is unprecedented in the history of the automotive industry, tire companies in Akron have surged ahead to production records which forbode another tire surplus and which indicate an actual present over-production, according to President Harvey S. Firestone of the Firestone Tire & Rubber Co.

In reviewing the present tire situation, Firestone says:

Our information shows that there is a large overproduction in tires now in many sizes and types. In fact the demand all along the line has hardly kept pace with production, and as a consequence a surplus has been piling up.

It is expected that the usual increase in trade sales during the coming summer months will absorb this surplus, and I hope this will enable the rubber industry to maintain its present production schedule late into the autumn months.

We have no plans at present for a Firestone increase in production and therefore we are not hiring additional help. The demand for original equipment from automobile manufacturers is the chief cause of the present high point of tire production in Akron. Whether this demand will be maintained is uncertain. As far as I can see there is nothing in sight to warrant the belief that the tire industry will go much beyond its present production this year.

### Has Been One of Greatest Years

Firestone's warning comes in the face of one of the greatest booms the tire industry has known, not even excepting the then unprecedented spurt of early 1920. Every tire company in the city is producing to its limit and is crying for more men, advertising for them in other cities and boosting wages as an added attraction.

Tire output has been over 85,000 a day now for more than six weeks and is steadily increasing. Firestone is running between 24,000 and 25,000 a day, and Goodyear has climbed to 26,000 a day. Unofficially it is said that Goodyear is considering a temporary production of nearly 30,000 a day, provided men are available, in order to catch up with orders and to replenish its exhausted finished goods inventory.

There are several manufacturers, however, who agree with Firestone that the possibilities of another huge tire surplus are increasing.

### AMERICAN BOSCH SALES DRIVE

SPRINGFIELD, MASS., June 12—Branch managers of the American Bosch Magneto Corp. decided at a convention at the factory that with business conditions rapidly improving a vigorous and intensified sales drive should be made immediately with the idea of taking full advantage of increasing sales possibilities.



## Finance Companies Take Up Zone Plan

Plan Discussed at Convention to Have Eight Sections Throughout Country

INDIANAPOLIS, June 9—Among the projects discussed at the morning session of the National Association of Automobile Finance Companies, which has been in convention here, was the districting of the country into eight sections and the holding of sectional meetings to take up matters affecting the districts and the national association. At present the organization membership is confined to state and local associations, with headquarters in the principal cities. The plan for the district division went over to be acted upon at subsequent meetings and for consideration by the board of directors at conferences, the first of which will be held in Pittsburgh in October.

### First Convention Held

The convention, which was the first held by the organization, brought together 150 representatives whose companies in 1921 carried on a billion dollars' worth of automobile financing. The attendance did not represent the total strength of the organization, for several of the largest companies which are members had no delegations, and their business was not accounted for in the statistics gathered.

According to President Fred A. Weber, Jr., the national character of the automobile necessitated the organization of the association last fall. It was found necessary to have at some central point a medium for gathering complete reports of every financing negotiation of automobiles and motor trucks in order to offer fullest protection to the companies issuing finance paper, and for the advancement of the interests of the men in the automotive industry who look to such financing from these companies.

A movement toward educational campaigns and active work to show the need of more uniform state laws governing finance operations was considered favorably by the convention in its endeavor to provide in the future the most dependable sort of service to the automotive industry, and to simplify the business of companies which are operating over wide areas.

### Safeguarding Business

Reports and statistics show that from 50 per cent to 75 per cent of the overhead of all the finance companies in the association is devoted to the credit and collections department in the effort to throw the strongest safeguards around the business. Because of this active effort to establish the business more soundly and to show its solidity, the finance companies have been able to show banks that there is no longer undue risk from such automobile paper when issued

by reputable finance houses that follow the tenets of the association.

At the close of the afternoon session C. A. Vane, general manager of the National Automobile Dealers Association, told of the active interest of the dealers in the future welfare of the finance companies and the desire of his organization to co-operate to the fullest degree possible for the best interests of both the organizations and their members.

During the day the Indiana Finance Association, which acted as host, held its meeting and elected the following officers for the year President, Frank A. Fisher, Indianapolis; vice-president, C. H. Stratton, Sullivan; Roy Myers, Evansville; F. A. Shively, Lafayette; Edmund Bittler, Fort Wayne; secretary, Joe Twitty, Indianapolis, and treasurer, Ben Sagalowsky, Indianapolis.

The banquet in the evening was addressed by Weber, Walter E. Heller, first vice-president, of Chicago; S. S. Stratton, president of the Commercial Acceptance Trust; Henry Warrum, president, National Auto Insurance, and ex-Mayor Charles A. Bookwalter.

## May Lose Dealers' Plates as Result of Speed Trip

NEW YORK, June 12—A new obstacle for motor car manufacturers who seek to establish endurance and speed records in this state has arisen as the result of the announcement by the Wills-Sainte Clair Co. that one of its cars had been driven to Montreal and back, a distance of 804 miles, in 19 hours and 50 minutes, an average of slightly more than 40 miles an hour.

Bert Lord, director of the New York State Motor Vehicle Bureau, has sent a letter to the Wills-Sainte Clair Co. asking it to show cause why its right to operate cars under dealers' plates should not be revoked. He pointed out that the state's motor vehicle law stated that "a rate of speed in excess of 30 miles an hour for a distance of one quarter of a mile shall be presumptive evidence of driving at a rate of speed which is not careful and prudent." Lord's letter declares the Wills-Sainte Clair test "a flagrant violation of the state law."

The car was driven on this trip to Montreal and back by B. E. Smith, who is connected with the Fisk Tire Co. in this city.

### PACKARD IGNITION ENJOINED

NEW YORK, June 12—Judge Hough in the Federal District Court, with the consent of the Packard Ignition & Electric Co., Inc., defendants in a suit instituted by the Connecticut Telephone & Electric Co., granted the plaintiff a perpetual injunction restraining the defendant corporation from further selling Breaker plate. It was contended in the complaint originally filed by the plaintiff that the sale of this material by the plaintiff was an infringement on the patent.

## 8,770 Trucks Ready To Be Dumped Here

Pending Legislation Halts Shipments of American-Made Vehicles from Europe

PARIS, June 10 (By cable):—There is a total of approximately 7000 American made army trucks in France, which will be dumped on the American market, at prices far under the regular list, as soon as they can be reconditioned and shipped back to the United States. Of this number approximately 50 per cent are now serviceable and will need no reconditioning.

In addition to the 7000 in France there are 1770 trucks in the hands of dealers in England according to the British Liquidation and Disposal Board, which still remain to be sold, and which it is expected will be returned to the United States to compete with new trucks.

Because of the pending legislation in Congress at Washington, shippers are withholding immediate shipment for fear that the 90 per cent re-import tax might be imposed before the shipments can reach the United States.

### Expect Facts to Aid Graham Bill

WASHINGTON, June 12—The announcement that there is a total of approximately 8770 trucks in Europe available for re-import to the United States, it is expected, will effect the needed passage of the Graham resolution (HJ 183), introduced in Congress at the request of automobile dealers, and which will, it is declared, prevent the dumping of war trucks and passenger cars into the United States by imposing a 90 per cent re-import tax on all automotive vehicles returned to this country.

Opinion has been expressed by members of the Senate finance committee who must pass on the measure that there is no real need for the passage of the Graham anti-dumping bill. The statement was made before the House Committee by the automobile dealers that there were approximately 5000 trucks abroad which could be brought back into this country and sold, even with the return freight added, at considerably under the market, thus demoralizing the United States trade.

### BIG INCREASE BY BUDA

CHICAGO, June 13—The Buda Co. reports that since last December its increase in business has been over 700 per cent, covering the matter of releases secured for engines for truck service. Within the last 60 days there has been a great volume of releases of engines for the larger capacity trucks, an indication of improvement in general business conditions. The releases are coming from all parts of the country.

## Covers 67.38 Miles on Gallon of Benzol

### Citroen Successful Competitor in Le Mans Test—Breaks All Previous Records

PARIS, May 30 (*By Mail*)—All fuel consumption records were broken at the Le Mans trials when a four-cylinder four-passenger Citroen, weighing complete 2485 lb., covered a distance of 100.4 miles on an allowance of 1.49 gallons of fuel, this being at the rate of 67.38 miles to the American gallon. During this performance the speed never fell below 25 miles an hour. A similar Citroen got second prize by covering 99.9 miles on the same quantity of gasoline, or at the rate of 67.04 miles to the gallon. Both cars used straight benzol and were equipped with the Solex carbureter.

The severity of the trials at Le Mans reduced the number of competitors, only twelve cars facing the starter. Unlike previous years, a minimum average speed had to be maintained throughout the competition and the amount of oil consumed had not to exceed 7 per cent of the gasoline allowance expressed in cubic centimeters. This was done in order to prevent competitors getting a low gasoline consumption at the expense of their oil supply, which was a feature of last year's trials.

#### Little Oil Used

The winning Citroen used only three ounces of oil to cover a distance of 65 miles, while on several cars the amount of oil used was so low that it was difficult to measure it.

For this competition Citroen presented a new sports type car with an overhead valve, four-cylinder engine of 2.67 by 3.93 in. bore and stroke, having a compression of about 85 lb. to the sq. in. The valves are operated by pushrods from a camshaft in the crankcase. So far as chassis features are concerned, this new model is practically identical with the standard production of the Citroen chassis, and even some parts of the engine are similar on the two models.

### RADIO USED TO CARRY MESSAGE OF N. A. C. C.

NEW YORK, June 12—Radio telephony was the means of carrying a story of the progress of the automobile industry to thousands in the radio audience when Alfred Reeves, general manager of the National Automobile Chamber of Commerce, spoke from the broadcasting station WJZ at Newark, N. J.

He briefly reviewed the history of the automobile industry, spoke of the early trials of manufacturers and owners and contrasted these with the comparative perfection of the car of to-day. He also called attention to the growing use of radio among automobile owners, both for commercial purposes and for amusement.

It is intended to get into production with this overhead valve model at an early date.

A 91 cu. in., four-cylinder Mathis captured third place on the general list with a consumption equal to 65.09 miles to the gallon. This car was handicapped by the accidental loss of a small amount of gas at the start. A couple of Chenard-Walcker cars, with 183 cu. in. overhead valve engines, averaged respectively 42.23 miles and 40.59 miles to the gallon.

The biggest car in the competition was a sports type Voisin of 274 cu. in. piston displacement, which came to a stop after covering 62.2 miles on an allowance of 2.49 gallons. This car, which is equipped with a Knight type sleeve valve engine, averaged 47½ m.p.h. and consumed 22 ounces of lubricating oil before the engine stopped.

Considered on a basis of miles per gallon, without any consideration of fuel allowance a two-seater 67 cu. in. Mathis made the best showing by averaging 99.11 miles to the gallon. On the basis of fuel cost per passenger, the winning Citroen driven by Poulain was the best, for the cost of fuel worked out at 1 fr. 61 cent per 100 kilometers.

## Use Up Inventories on Passing Models

### Heavy Buying Presages Discontin- uance of Some Lines Ear- lier Than Anticipated

DETROIT, June 12—One important effect of the heavy buying in the early part of the year is that it has given manufacturers an opportunity to use up inventories on models which they had planned to discontinue with far greater rapidity than had been anticipated. As a result of this buying it is certain that the next three months will find announcements from at least four important companies that they have discontinued manufacturing certain models in their lines.

Two models have already practically been taken from the market, the Scripps-Booth by General Motors and the Briscoe by the now Earl Motors, Inc. In the latter there are only a few in the roadster and the coupe now unsold, the phaeton and sedan having found ready sale under the impetus of reduced prices and being now entirely sold. In both of these makes the service will be continued indefinitely.

Other models which will be taken from the market when the stock of material is exhausted will also be serviced indefinitely by the makers, who will concentrate their manufacturing facilities on other models in their lines.

The fall season will also witness the appearance of new models in several other lines; in one of these it will be a complete new line, and in others, the presentation of new closed models. There are likely to be manufacturing economies emphasized in some of the closed car bodies making their appearance, which will probably result in closed car prices more closely approximating those on open models.

#### Large Absorption of Labor

There has been a large absorption of labor in the Detroit district since April 1, every factory having added heavily to the working forces employed at that time. In addition to taking up all the unemployment that existed in the city, many hundreds of men have been brought in from outside districts, among these being large number of striking coal miners and farm laborers, as well as many skilled mechanics from other industrial centers.

#### AUTOCAR OPENS NEW BRANCH

NEWARK, N. J., June 12—The Autocar Co. has opened its new factory branch building in this city. It is one of the largest service stations of its kind in the country, with 77,000 feet of floor space on the street level. In addition to sales and service facilities, it will provide warehousing space and a reconditioning department for the entire Greater New York district. The new building, which is located on Frelinghuysen Avenue, covers a city block with entrances on four streets.

### RESULTS OF FUEL CONSUMPTION TEST

	Piston displace- ment	Weight pounds,	Fuel al- lowance, gallons	Distance covered, miles	Miles per gallon	Minimum speed, miles
1. Citroen, Poulain..	91 in.	2,486	1.49	100.4	67.38	25
2. Citroen, Barbier..	91 in.	2,488	1.49	99.9	67.04	25
3. Mathis, Lahms... 91 in.		2,535	1.51	98.3	65.09	25
4. Chenard, L. Che- nard .....	183 in.	4,207	2.18	92.07	42.23	21
5. Citroen, Labaume.	91 in.	2,844	1.49	89.5	60.06	25
6. Chenard, Leonard.	183 in.	4,166	2.18	88.5	40.50	31
7. Mathis, Bocchi ...	67 in.	1,560	0.79	78.3	99.11	22
8. Bignan, Gros ....	122 in.	2,863	1.58	67.02	42.41	28
9. Voisin, Gauderman	274 in.	4,651	2.49	62.2	24.98	37
10. Mathis, Colliere ..	91 in.	2,122	1.27	55.56	43.74	25
11. Mathis, Milsant ..	45 in.	1,199	0.72	53.26	73.97	18



## Steel Is Big Factor in Parts Shortage

### Manufacturers Keep After Producers—Plants Expanding to Meet Demand

DETROIT, June 12—Timken-Detroit Axle Co. has succeeded in setting up most of the equipment without which it has been handicapped in meeting the heavy pressure of business, and will be in a position to meet deliveries in full within the month. Night and day forces will be continued to meet commitments, and in the meanwhile the company will continue to apportion its product so that all customers will be cared for.

The company reports difficulty in obtaining steel in the quantities needed, but is enabled to meet its requirements by keeping vigorously after the steel producers. There is no anxiety over the company's coal situation, but it reports that steel men ascribe shortages in that market to the inability to get coke.

### Continental Makes Additions

Continental Motors Corp., with additional factory space at its Muskegon plant and most of its new equipment now set up, is about ready to enter large production on its single six engines and the several special models, which it is to make for other customers, notably Durant. Quantity production on the six will start late in June. The Star engine will be in large production in August. On its other models the company has been meeting commitments on a fairly even basis, having been handicapped by labor shortage temporarily.

Aside from these two companies, deliveries of parts have been commensurate with the early commitments placed by companies. There is a great deal of difficulty in obtaining deliveries of parts and materials ordered at short notice, but this is not due to any shortage. The failure to anticipate requirements in actual quantities is making last minute shortages, but the only real shortage is steel.

There is no disposition to make commitments over longer periods, parts makers report, the car and truck makers holding their buying for the most part to thirty day periods, though there are a number of companies which are buying on a wider time margin.

### Commitments Run Lighter

Commitments at this time for July are running considerably lighter than for June, parts makers report, but this is only a repetition of a buying condition which has manifested itself all year. Early commitments for any month this year have been much lighter than the quantities that manufacturers afterward sought. It may be possible that July manufacturing will drop to a point where the early commitments will be sufficient. They have not been for any other month to date.

Some body makers are complaining of a shortage of plate glass, others de-

## LIQUIDATION OF WILLYS CORP. ASSETS MEANS GOOD FIRST PREFERRED RETURN

New York, June 12.

**H**OLDERS of the \$15,000,000 in 8 per cent cumulative converted first preferred stock of the Willys Corp. are likely to realize a substantial amount through the liquidation of the corporation's holdings. This stock has preference as to assets over both the second preferred and the common stock and in the case of voluntary liquidation or dissolution the holders are entitled to 110 and accrued dividends.

When the petition for a receivership was filed the liabilities were estimated at from \$10,000,000 to \$14,000,000. Supplemental claims will increase them to about \$19,000,000.

The sale of the corporation's assets promises to net approximately \$25,000,000. It owns 730,000 shares of common stock of the Willys-Overland Co. which now is quoted around nine on the stock exchange. This gives a book value of \$6,570,000. The Electric Auto-Lite division was sold for \$4,700,000 and the plant at Elizabeth, N. J., for \$5,525,000. This makes a total of \$16,795,000.

The book value of the New Process Gear division at Syracuse is \$2,650,000 and it is expected to bring at least \$1,500,000 when it is sold. Other assets include \$1,000,000 par value in Fisk rubber common stock, \$1,000,000 par value in Federal rubber stock and other securities with a par value of about \$3,000,000. The total book value is about \$3,000,000. The corporation has on hand about \$1,000,000 in cash and approximately \$4,000,000 in notes and accounts receivable.

Estimating the liabilities at \$19,000,000 it will be seen that the dividend on the first preferred would approximate around 40 per cent.

clare their supply ample. The situation in this market is declared to be similar to that in other supply markets, a matter of getting commitments in early and in ample quantities. Plate glass deliveries are now on about a two months basis.

### Maxwell Had Plans for Chrysler Six

(Continued from page 1344)

from the National Park Seminary, as he had promised he would take her abroad as soon as her course was over.

Directors of the Maxwell corporation gave Chrysler a dinner at the Metropolitan Club last night in recognition of his achievement in putting Maxwell back on its feet in so short a time. E. R. Tinker, president of the Chase Securities Corp., presided and announced that Chrysler would be the only speaker.

Chrysler outlined briefly his connection with the Maxwell company since he became chairman of the reorganization committee while still vice-president of the Willys corporation. He said he had promised the directors that he would put out a new model on which the profits would be from \$5 to \$15 per car. He was somewhat proud, he said, of the fact that 40,000 of these new models already had been sold. The output in May was 6527 on which the profit was something more than \$100 each. The June production will be not less than 6400, and the output for 1923 will be at least 100,000.

Chrysler said he had been asked frequently whether he would remain with the Maxwell company. He answered it by declaring that the Maxwell directors had stood by him and that he would stand by them.

## Durant High Bidder For Elizabeth Plant

(Continued from page 1344)

Whether or not the sale is to be confirmed will be determined in Federal court at Trenton, Monday. If it is confirmed and the property goes to Durant, he will sell a considerable portion of it including 24 lots of machinery inventoried at \$2,340,000, a baseball park valued at \$72,719 and a garage with book value of \$50,000.

If this property brings its inventoried value, the plant will actually cost Durant only \$3,062,281, which was less than he offered for it at private sale. It can be said that Durant proposes to make no use of the rights and designs for the Chrysler six, which was to have been built in the Elizabeth factory.

If the sale is confirmed, the plant will be equipped as rapidly as possible for the assembling of 500 Star cars a day. This will not take more than 60 days and every effort will be made to shorten this period. The factory was designed in 14 units, each of which will provide an assembly chain. These assembling facilities will be installed in units as speedily as possible.

F. W. Hohensee, president of the Durant Motor Car Co. of New York and chief engineer for the Durant plants at Long Island City, Lansing and Toronto will be in charge of Star production. It is probable the Elizabeth plant will be operated by a new subsidiary to be known as the Durant Motor Car Co. of New Jersey. This company has not yet been incorporated. Star Motors, Inc., will be solely a sales company to which Durant Motors has contracted to deliver the complete Star car.

## Men of the Industry and What They Are Doing

### McConnell Touring Country

D. A. McConnell, president of the Klaxon Co., Newark, is making an extensive trip through the country, calling on Klaxon distributors in the South, Middle West and on the Pacific Coast. He is not expected to return to the factory until about July 1.

### Dumaine, Mack Trucks Director

F. C. Dumaine, treasurer of the Amoskeag Manufacturing Co., has been elected a director of Mack Trucks, Inc., succeeding E. R. Hewitt, resigned.

### Peck Directs Traffic Sales

Charles C. Peck, Jr., has been appointed general sales manager of the Traffic Motor Truck Corp. He has been with the Traffic organization for over three years, first acting as manager of the New Business Department, then as assistant general sales manager.

### A. M. Dean Joins Rubay Co.

A. M. Dean, connected with the Templar Motors Co. as chief engineer since its inception, has become associated with the Rubay Co., Cleveland, in the same capacity in the production of a chassis for town cars exclusively. No phaeton models are contemplated by the company.

### Kiefer Service Manager of Buda

W. C. Kiefer has been promoted to the office of service manager of the engine division of the Buda Co., succeeding R. A. Kiken, who has resigned to join the Motive Parts Co. of America, Inc., Chicago, as sales manager. Kiefer has been with the Buda company for seven years, and for some time has been acting as assistant service manager.

### C. L. Heyniger Transferred

C. L. Heyniger, formerly an assistant to Alfred Sloan, Jr., vice-president of the General Motors Corp., in charge of production, has been promoted and transferred to the sales department of the Chevrolet Motor Co. at Tarrytown.

### Awarded Medal of Merit

J. F. Keller, vice-president of the Keller Mechanical Engraving Co., Brooklyn, has been awarded the Edward Longstreth Medal of Merit by the Franklin Institute for his automotive die cutting machine of the reproducing type.

### Whiting with Greenfield Corporation

W. E. Whiting is now associated with the Greenfield Tap & Die Corp. and will be located in Detroit. Whiting has been connected with the grinding industry for 14 years. From 1909 to 1916 he

was with the Heald Machine Co. of Worcester, Mass., as apprentice, journeyman grinder, demonstrator and finally as superintendent of the grinding department. In 1916 he went to the Norton Co., where he did laboratory and demonstration work for a short time. He is well known in Michigan, where for the last four years he has handled sales for the Grinding Wheel Division of the Norton company. Whiting will represent the machine tool division of the Greenfield corporation.

### Promotion for W. P. Loveless

W. P. Loveless, who for the last three years has been alternately assistant sales manager and sales manager of the William R. Johnston Manufacturing Co., has been promoted to the position of assistant to the president. William R. Johnston, president and general manager, will devote the greater portion of his time to production and development of new lines. Sales work and advertising will be directly under the supervision of Loveless. R. W. Keyt, formerly sales promotion manager of the I. J. Cooper Rubber Co. of Cincinnati, has become identified with the Johnston company, in charge of the sales promotion department, covering directly the Johnston jobber end of the business.

### Ralph Templeton Promoted

Ralph Templeton, for several years manager of the Whitman & Barnes Manufacturing Co.'s New York office and store, will assume an important position in the company's executive offices in Akron, July 1. Templeton first entered the employ of the Whitman & Barnes organization in 1898 and has served it in various capacities continuously since then. After serving in the Akron office and as Detroit representative, he was appointed manager of the New York store in 1910.

### A. H. Frost with Cox Brass

A. H. Frost, formerly chief engineer of the Van Blerck Motor Co., for which he designed a 4-cycle engine, and more recently vice-president and sales manager of the J. V. B. Engine Co. of Akron, has joined the Cox Brass Manufacturing Co. of Albany, which he will represent in its relation with the engineering departments of motor car manufacturers.

### J. W. Meely Resigns

J. W. Meely, Detroit branch manager of the Studebaker Corp., has resigned, effective at once. Meely has held the position one year. Before joining the Studebaker Corp., he was sales manager of the Barley Motor Car Co. at Kalamazoo for two years. His plans for the future have not been announced.

### Zimmerman Visits Plants

H. G. Zimmerman, manager of the Australasian division of General Motors Export, spent a week visiting the Oakland plant at Pontiac, the Buick plant at Flint, the Chevrolet central offices at Detroit, the plant of Canadian Products, Ltd., at Walkerville, Ont., and General Motors of Canada, Ltd., at Oshawa. The main object of his trip was to complete arrangement for the manufacture in the United States of Oakland and Chevrolet right hand drive chassis for the Australian market. On his visits to Flint and Oshawa, Zimmerman was accompanied by W. H. Morris of Morris & Morris, Queenstown, South Africa, Buick and G. M. C. distributor.

### Carmody Representing Weaver

John D. Carmody has joined the sales force of the Weaver Manufacturing Co., Springfield, Ill., his territory including Michigan, Indiana, Ohio and Kentucky as well as Buffalo, N. Y., and important cities in Pennsylvania and West Virginia. Carmody is well known in the industry, having been connected with the Champion Spark Plug Co. for a number of years and being associated with the Wainright Piston Ring Co. until its consolidation with the McQuay Norris Manufacturing Co.

### Jack Cooper Expands Activities

Jack Cooper, in addition to representing the Walker Manufacturing Co., has become sales director of the E. A. Laboratories, Brooklyn, to succeed William Von Elm, who has resigned after three years service as vice president and sales manager.

## Tire Dealers Threaten to "Shop" for Stocks

CLEVELAND, June 13—"Instability of prices for tires and uncertainty of adjustments is forcing many automobile owners to take chances on the less known makes of tires," reads a report of the special committee of the Cleveland Tire Dealers Association, which was appointed some time ago to make an investigation of the subject and to report.

The report concludes with the warning: "Unless adjustment of tire prices is made quickly, the tire dealer will follow the lead of the tire-buying public and will go shopping."

The committee states in its report that if the tire industry is to hold its place among the leading industries of the country and those engaged in the manufacture and sale of the product are to realize any measure of prosperity within the next few years, a complete revision of policies and practices, as well as adjustment of prices, must be made immediately.



## Lelands Quit Lincoln; Ford Operates Plant

Severance of Relations Said to Be  
Due to Disagreement Over  
Methods

(Continued from page 1345)

satisfactory to Henry Ford, who spent much of his time at the plant with his engineers seeking increased efficiency in connection with the attempts to increase production.

Some of the work of manufacturing has been transferred to the Ford plants at Highland Park and River Rouge. This has resulted in the close connection of the Lincoln and Ford companies in manufacturing. This was one of the points that the Lelands had always been most desirous of keeping entirely separated. To them it seemed that the linking of the high class car with the inexpensive one would have a bad influence on Lincoln business. With an amalgamation of the two companies, all of the departments will come under the direction of Ford executives.

The Lelands own no stock in the new Lincoln company. It was understood that when the property was taken over by Ford, he paid the Lelands the full amount of their actual investment in the original Lincoln company. It is reported that Ford will pay each of them an additional \$250,000 to cancel their contracts.

### Rate of Output Ascribed as Reason

In the absence of an authoritative statement on the cause of the break between the Lelands and Fords, automotive circles generally have accepted the report that the break was due to incompatibility on manufacturing policies. Persons close to Ford, however, declare this not to be the case and ascribe it to a failure of the plant under Leland guidance to make satisfactory returns on the investment.

Prices fixed following the sale in February were based upon the ability to speed up production to a point approximating 50 to 60 cars daily. To date the best production reached has been about 30, whereas the orders on hand and obtainable would warrant a production double and treble the present rate. There has been no opportunity for the Ford sales organization to function with a low production rate, and orders booked by the former Lincoln organization could not be met.

With the company completely under Ford control, it is said much of the parts manufacturing will be transferred over to Ford plants, so that it may be turned out in a more economical and efficient manner.

### 1800, HENDEE JUNE PROGRAM

SPRINGFIELD, MASS., June 13—The Hendee Manufacturing Co. has given no sign of slackening production. About 1800 cycles will be built this month, and

the July prospect is favorable. Export orders call for the early shipment of 800 cycles to England, Holland, Belgium, Sweden, Czechoslovakia, Italy, Australia and South Africa. It is stated that during the past four months the company has filled orders from American police departments for 560 motorcycles and 240 sidecars.

## Pietsch Named Manager of Kelly-Springfield

SPRINGFIELD, OHIO, June 13—E. O. McDonnell, has resigned as general manager and vice-president of the Kelly-Springfield Motor Truck Co. Frank H. Pietsch succeeds him. Pearl A. Lewis has been named assistant general manager. He has been associated with the company for years. Pietsch, formerly of Chicago, joined the Kelly force here several months ago as general sales manager.

McDonnell announced his resignation upon his return from New York City. The resignation was accepted by President Charles W. Young, whose headquarters are in New York. Inasmuch as there are a number of important matters unfinished of which McDonnell has special knowledge, he will continue as vice-president until Aug. 1. While relations with the company are most cordial, McDonnell says that his personal affairs make it necessary for him to return to New York, where he expects to be associated with the same interests with which he was connected before coming to Springfield.

## May Urge Endorsement of Motor Vehicle Law

NEW YORK, June 13—A committee representing the highway departments of 10 eastern states, which conferred here last week with committees from the National Automobile Chamber of Commerce and the Society of Automotive Engineers, probably will recommend endorsement of the uniform motor vehicle law at a general meeting of the highway departments at Baltimore, July 17. If the recommendation is adopted, it will carry considerable weight with the legislatures of the 10 states. If the uniform law were adopted by most of these states, it undoubtedly would be only a comparatively short time before the rest of the country swung into line.

Another question to be considered at Baltimore will be a uniform formula for rating trucks in these states.

### FIAT PLANT SOLD

POUGHKEEPSIE, N. Y., June 15—The factory in this city of the Electric Auto-Lite Corp., which was formerly the Fiat assembling plant, was bid in at receivers sale yesterday by C. O. Miniger of Toledo for \$300,000. Miniger, who already has bid in the Auto-Lite plants at Toledo and Fostoria, said he expected to open the local plant in the near future.

## Long Tells Ad Men of Trade Body Aims

Every Industry Must Build Itself  
in Line with Public Policy,  
He Says

MILWAUKEE, June 12—"Building collective good-will is the chief aim of trade associations and trade advertising," said John C. Long of the National Automobile Chamber of Commerce, speaking before the educational conference of the Associated Advertising Clubs of the World here to-day.

"Selling more goods, reducing cost of manufacture and exchanging trade information may be the more immediate activities," he said, "but fundamentally every industry must aim first to build itself in line with public policy."

He continued with saying:—

Upholding the honor of the business family means that one must destroy or reform the enemy within the gates. The "shady" dealer, the "fly-by-night," the out and out swindler must go. In the realm of advertising, the trade association finds the A. A. C. of W. a shining sword of defense. The trade group needs but to make complaint against the unscrupulous, contribute funds in accord with its ability to pay, and the forces of Truth-in-Advertising are put into action.

The trade association can take a further constructive part in building goodwill by telling the public about the traditions and activities of its industry.

It can relate, for instance, how cooperation is saving the cost of production. The members of the National Automobile Chamber of Commerce, for example, exchange patent rights of over 500 patents without payment of money, thereby saving the high cost of litigations and royalties. The Society of Automotive Engineers has developed 245 standard parts which has meant a saving of \$124 per car and \$171 per truck annually in manufacture. In a competitive industry such as this the lower costs are immediately reflected in lower prices.

### N. A. C. C. Meeting at Chicago

CHICAGO, ILL., June 13—Thirty automotive manufacturers were represented at the meeting of the National Automobile Chamber of Commerce advertising managers' meeting at the University Club here to-day. Edward S. Jordan presided and John C. Long represented the chamber. The discussions of the day were varied, but there was evidence that practically all of the advertising men and the firms they represented are taking the question of dealer selection and dealer importance in the sales plan more seriously than ever before.

### C. G. BARLEY DIES

MARION, IND., June 12—C. G. Barley, president of the Indiana Truck Corp., died at his home here yesterday, following an illness of several months. His association with the industry covered a long period. He was identified with many local enterprises, and at one time was interested in the Rutenber Motor Co.

## New York Is Shown Five Models of Star

Line Includes Phaeton, Roadster,  
Sedan, Coupe and Deliv-  
ery Bodies

NEW YORK, June 14—The first showing of the Star car in New York was given to-day at the salesrooms of the Poertner Motor Car Co. Five models were displayed at the following prices: phaeton, \$348 or \$443, with starter and demountable rims; roadster, \$319 or \$414, with starter and demountable rims; sedan with starter and demountable rims, \$645; coupe with starter and demountable rims, \$580. All prices are f.o.b. Detroit. Delivery bodies were also exhibited. The phaeton is the only one which had previously been shown.

After the phaeton was exhibited at Washington, March 9, and at the Boston show, it was withdrawn until the Durant factories were prepared to meet the demands with quantity production. Notwithstanding this fact, Star Motors, Inc., has on hand orders for several thousand cars.

The roadster and phaeton bodies are largely of metal and are conventional in lines and most other particulars. These bodies are to be assembled at the various plants where the cars are assembled, while the closed bodies will be purchased outside.

### Construction of Car

A substantial tire carrier has been added to the rear of the chassis frame, and conventional running board brackets are to be used without the angle iron brace between them under the gearset, which was shown on the first chassis. The worm-and-worm-wheel type of steering gear is to be furnished by the Warner Gear Co., which also supplies the gearset. The lower end of the worm wheel spindle is bent forward below its guide, thus forming an integral steering arm. The rear end of the gearset is supported on the two brake shafts which are pivoted at each end in the main frame. Brake rods are of flat steel with forged ends welded on. The battery box is formed from flat strip stock bent to shape and hooked over the cross member to which the gearset is bolted.

The Morse chain used in the engine can be adjusted by rocking the generator outward. The water pump is driven off the rear of the generator unit through a flexible hose-type coupling, which takes care of the change in alignment when the generator is moved. The starting motor, when furnished, is strapped to a bracket cast on the crankcase on the right side below the water pump and is provided with Bendix drive. It can be easily attached if purchased separately.

### MORE HUPP DEALERS

DETROIT, June 13—Hupp Motor Car Co. is encouraging its distributors in all

cities to open up their territories to additional dealers in such number as the size of the territory warrants. Although the appointment of the subdealers is left to the discretion of the distributor, the company has adopted the policy of seeking the most intensive means of covering its entire territory that may be employed successfully.

New York has witnessed the opening of another Hupp dealership in the past 10 days, but there are already 16 Hupp dealers in Chicago and a number in most other important cities.

## Davis Building Phaeton Smaller Than Old Model

RICHMOND, IND., June 13—The Davis Model 71 phaeton is a lighter, smaller six than the series 61 models, which have been in production for some time. Model 71 phaetons are now in production and deliveries are being made to distributors and dealers. So far only one body model is being placed on this chassis, this being the phaeton at \$1,195. The engine, which is a Continental,  $3\frac{1}{2} \times 4\frac{1}{4}$ , is slightly smaller than that used on the larger model, and the wheelbase is 114 in., 6 in. less than the other model. The regular equipment is Distel wheels and 31 x 4 in. cord tires. The road weight is 2645 lbs.

The other units of the car are the same as the previous model, namely Timken, Delco, Borg & Beck, Warner, etc. The upholstery is long grain, genuine leather, French pleated over curled hair and coil springs. The top is from double texture fabric and is hand-tailored to each individual body.

Rear vision is provided for by a large rectangular plate glass window. The finish is in dark blue for the body, hood and wheels, the fenders and chassis being black enamel. The headlamps are drum type, finished in nickel and black enamel.

## American Steam Truck Co. Produces First Phaeton

CHICAGO, June 10—The American Steam Truck Co. this week turned out from the factory its first steam 5-passenger phaeton, which the company plans to sell at \$1,650. Four more of the cars are being assembled in the plant here and will be on the streets within a few days, according to R. R. Howard, president of the company.

A production schedule has been arranged for 100 cars to be turned out as soon as possible after the first five have been completed, Howard said. The company's first steam truck was produced about six weeks ago.

### FRANK G. CARRIE DIES

NEW YORK, June 12—Frank G. Carrie, until recently vice-president of the Marmon Automobile Co. of New York, died at his home on Gerber's Island Saturday. He was 57 years old and was well known as one of New York's pioneer automobile tradesmen.

## Government to Make New Tractor Survey

Proposed Campaign for Farmer  
Will Be Tabled Pending  
Its Completion

WASHINGTON, June 13—A comprehensive survey of the relative cost of tractors, as compared with horse power for use on farms, will be undertaken by the Department of Agriculture, in order to determine definitely the value of tractors on farms.

A recent report made by that department based on a survey of 1500 farms, showed that, in the main, farmers were partial to tractors, but had to depend on horses to a great extent. The survey, it is maintained by tractor manufacturers, who immediately sought a conference with the department officials, was not "fair" to the tractor industry in that it did not take into consideration various phases favorable to the tractor, such as feeding stock, cost and time of raising food and fodder for plow horses, rest for horses and cost and care of harness, etc.

A protest, at the same time, was received from horse breeders by the Bureau of Animal Husbandry, also a branch of the Department of Agriculture, that they would strenuously object to the tractor industry being favored in a survey, detrimental to the horse breeder.

### No Favor Shown

Because of the protests made by the horse breeders and by the tractor manufacturers, the survey by the department will be made and the facts published, regardless as to whether the results favor the tractor or the horse as a more economical factor in farming.

At the final conference on the question, the tractor manufacturers, through their spokesman, J. B. Bartholomew of the Avery Co., Peoria, Ill., acquiesced in the department's plan to make a national survey, and consented to the "tabling" of a proposed educational campaign of farmers to the use of tractors, pending the report of the survey.

## Moon Develops Sedan For Its 6-40 Model

ST. LOUIS, June 12—The Moon Motor Car Co. has developed a new 5-passenger 4-door sedan, fitted to the 6-40 Moon chassis, priced at \$1,695. Previously only the phaeton has been put out on this chassis. The price of the sedan is only \$400 higher than the phaeton. The body super-structure is built of hard wood, with all joints screwed and glued. The body panels are of 20 gage steel and are flanged by mechanical means, eliminating the use of solder. The mouldings are rolled around the door and belt to prevent cracking of paint. The roof is made of light bows and slats covered with wadding and waterproof top material.



## Tractors Play Part in Buying Movement

Sales Made in Ohio Territory Are  
Four Times Those of Year Ago  
—Show Better Conditions

COLUMBUS, June 12—Distributors and dealers in this territory report an unexpectedly large volume of tractor and power equipment sales during the first five months of the year. Total business done by some tractor distributors and branches is more than four times that done in the same period of last year.

A part of this demand for tractors can be traced to the unusually wet weather experienced during the past spring. Frequent rains interfered with soil preparation and planting. A farmer would disk-harrow a field but before he could plant it rain would come, and the harrowing operation would have to be repeated.

The tractor-drawn plows and harrows offered the only solution. Their superior speed enabled the farmers to prepare the bed and plant the seed between rains. And many farmers in this territory have bought tractors this spring because of this time advantage.

But this reason does not account for all the buying. Had similar weather conditions prevailed a year ago, little buying would have resulted. At that time the farmer's resources were too limited to permit of his buying.

### Farmers Recovering

The comparatively large volume of sales this year indicates that the farmers in this territory are rapidly recovering from the recent depression. They are making giant strides in their climb back to prosperity. They are adjusting themselves to the new conditions and are buying tractors to help them in that adjustment.

The farmers are paying for their tractors for the most part with notes. In some cases no cash is involved in the transaction.

Such paper is not readily salable to the bankers in this territory. The dealers must either be in a position to finance these sales or must have the assistance of the factory. A dealer representing a line which is not factory-financed consequently is under a prohibitive handicap unless he can finance the sales himself.

The banks have not adopted any rule against tractor paper. Some paper maturing next fall has been discounted. But, in general, paper maturing next year is not acceptable.

The farmers are on the whole satisfied with present tractor prices. They feel that the factories have done their share in getting back to pre-war levels.

### Backward Season Benefits

CHICAGO, June 12—Manufacturers reporting to the National Association of Farm Equipment Manufacturers state that in most cases their production and sales are now from 50 to 60 per cent of

normal. Summarizing the reports received, the association says

Improvement is noted in the sale of tractors and threshers, the backward season having reacted to the benefit of the tractor manufacturer because of the necessity on the part of the farmer for greater speed in preparing the soil for crops. Tractor stocks are moving out of the hands of dealers and jobbers and several factories are now shipping direct. Collections are reported better and an improved business tone is generally noted.

## U. S. Senate Advancing Gasoline Price Probe

WASHINGTON, June 14—Employment of counsel for the Senate Manufacturers Committee was authorized to-day in a Senate amendment to the LaFollette measure introduced last week for an investigation of the increasing cost of gasoline.

The amendment authorizes the subpoenaing of witnesses and provides a penalty for refusal of any witness to answer questions pertinent to the investigation.

According to figures made public to-day by the Bureau of Mines, gasoline production for April was 472,920,182 gallons, compared with 472,277,870 gallons during the preceding month and 426,000,000 in April last year. Stocks on hand May 1 were 892,267,766 gallons, compared to stocks on hand the same day last year of 747,000,000 gallons.

## John J. Watson, Jr., Heads New Industrial Motors Corp.

NEW YORK, June 14—Organization of the Industrial Motors Corp., a combination of the Selden Truck Corp. and the Atlas Truck Corp., has been completed. The new corporation is understood to be negotiating for the acquisition of several other truck and accessory companies.

John J. Watson, Jr., president of the Lee Tire & Rubber Co. and chairman of the board of the Martin-Parry Corp., has been elected president of Industrial Motors. The vice-presidents are George C. Gordon, Robert H. Salmons, Allan R. Cosgrove and James R. Floyd. Henry Hopkins, Jr., an attorney, has been elected secretary and treasurer.

### TARIFF SCHEDULE PASSED

WASHINGTON, June 15—The Senate has passed the automobile schedule in the tariff bill providing for a duty of 25 per cent as proposed in the House bill. The Senate finance committee has not yet determined what it will do in regard to a countervailing duty. This has been passed over at the request of Senator Townsend of Michigan.

### WILLIAM G. GRIEB DIES

NEW YORK, June 15—William G. Grieb, formerly president and one of the founders of the Ajax Rubber Co., died yesterday at his home at Scarsdale. He retired as head of the Ajax company about two years ago.

## Output Is Exceeded by Fordson Demand

Remote Parts of Northwest Only  
Section Not Calling for  
Tractors

DETROIT, June 13 — Demand for Fordson tractors is reported by the company to be running far ahead of production, some of its branches having in excess of 1000 orders ahead. The tractor delivery situation has been very tight for the last 60 days, and the company reports the demand coming from all parts of the country except remote districts in the northwest.

Reports from its representatives in the field indicate an entire absence of stocked tractors even in eastern cities, where last year considerable difficulty was experienced in finding markets. Shipments now are confined only to those branches where the demand is pressing, and for the present there will be no shipments of machines for display or demonstration purposes. The tractor demand is expected to continue until the latter part of July, when a temporary lull is expected preliminary to the opening of the harvesting season.

A large fall business in tractors is looked for from the farming districts, and an important winter manufacturing schedule will be outlined in anticipation of heavy business in the spring. Business in tractors for industrial uses is reported by the company to have shown remarkable increases since the inauguration of its campaign, designed to show the usefulness of the tractor in an industrial way. This campaign will be pushed vigorously, as the company plans to develop an industrial tractor business which will be commensurate with its farm business and thereby furnish an all season outlet.

### May Enter Trailer Field

Although there has been no official word as to the company's plans for production of heavy duty trucks, there are indications that these will be abandoned in favor of the plan to promote the tractor used with a trailer for industrial hauling. To further this plan there is a likelihood that Ford will enter the trailer manufacturing field, so that the vehicle may be sold as a unit.

### SUES INTERNATIONAL DRIVE

CINCINNATI, June 12—Seeking the rescinding of a partnership agreement by which the International Auto Drive Co. was formed and asking judgment for \$45,240, James A. Weaver has filed suit in Common Pleas court of Cincinnati against William M. Harris and George W. Martin, of this city, and the Dayton Securities Co. and Dayton Metal Products Co. of Dayton, declaring that he was fraudulently induced to enter into a partnership with the parties he names. The court granted temporary injunctions.

## FINANCIAL NOTES

Ford Motor Co. will pay a semi-annual disbursement of 3 per cent and an extra 3 per cent July 1 to approximately 18,000 employee holders of Ford investment certificates. With a similar disbursement at the end of the year the 1922 return will be 12 per cent, the same as in 1921. Sixteen per cent was paid in 1920, the first year of employee participation in earnings. Because of the extent to which the fund has grown employees will not be permitted to re-invest the July dividend but will be limited to the usual one-third of their annual salary. Ford's annual payroll is \$60,000,000, of which a maximum of \$20,000,000 a year could be added to the investment fund under the rules. About one-third of the employees are availing themselves of limit investment. Thus it is estimated that the fund is growing at the rate of more than \$5,000,000 a year. It totaled \$7,000,000 at the end of last year, of which \$2,000,000 came from branch employees. The present balance of investment certificates is understood to approximate \$10,000,000.

American Bosch Magneto Corp. reports bookings in May as \$860,000 or more than twice those of May, 1921. Comparison of the business done since the first of the year with the corresponding months a year ago follows: January, 1922, \$502,000; January, 1921, \$190,000; February, 1922, \$476,000; February, 1921, \$215,000; March, 1922, \$558,000; March, 1921, \$400,000; April, 1922, \$667,000; April, 1921, \$440,000; May, 1922, \$860,000; May, 1921, \$429,000. May also showed a substantial net profit, the first in a number of months. A statement of the corporation's financial condition as of March 31, 1922, shows cash and debts receivable, \$1,831,101, as against \$1,336,006 in 1921 and accounts and notes payable of \$1,283,570 compared with \$2,031,971 a year ago.

Watson Products Corp. of Canastota, manufacturer of wagons and motor trucks, made sales aggregating more than \$100,000 during May. March sales were \$73,000 and April sales \$78,000. The plant is in the hands of Kirk B. Delano, receiver. The claims against the company by 102 creditors total \$478,469. About 90 per cent of these creditors have agreed to accept 7 per cent cumulative first preferred stock in a new company the Watson Truck Corp., in full for their claims. Federal Judge Ray is expected to approve the transfer of assets of the old concern June 20.

Electric Storage Battery Co. has declared a quarterly dividend of 75 cents on the common and preferred stock, payable July 1 to stock of record June 14. Following the meeting of the board, the directors stated that while business of the company is excellent at this time they are not prepared to consider any increase in the dividend rate at the present time.

Pierce-Arrow Motor Car Co. shows a slight profit in current operations, indicating that an addition to the surplus may be reported for the second quarter, for the first time since September, 1920.

Duesenberg Automobile & Motors Co., Inc., has offered \$3,000,000 of its 8 per cent cumulative preferred stock at \$100 per unit, consisting of one share preferred and one half share common.

Firestone Tire & Rubber Co. is reported to be contemplating the issuance of \$1,500,000 bonds as part of a plan to finance the new plant under construction at Hamilton, Ont.

Mack Trucks, Inc., has declared the regular quarterly dividends of \$1.75 a share on both first and second preferred stock, payable July 1 to stock of record June 20.

Chandler Motor Car Co. has declared a quarterly dividend of \$1.50 a share, payable July 1 to stock of record June 20.

Columbia Now Has Orders  
for 23,700 Light Sixes

DETROIT, June 14—Stockholders of the Columbia Motor Car Co. were informed at their annual meeting by President J. G. Bayerline that the company now has on hand orders for 23,700 light sixes for delivery up to Jan. 1, 1923. This makes a total of \$25,000,000 worth of business pending for the remainder of the year. Directors were re-elected, and they subsequently re-elected the old officers, with the addition of George J. Martin as assistant secretary and treasurer.

The books of the company indicate that June will be its largest month, and officers declare that July will be 50 per cent better. Stockholders expressed their approval of the large production plans outlined. The financial position of the company was shown to be excellent. It was announced at the meeting that Columbia now has 102 distributors in the United States and Canada, exclusive of foreign connections, and 1015 dealers.

1,748 Vehicles Shipped  
by Packard During May

DETROIT, June 10—Packard Motor Car Co. shipments for May, 1922, were 1748 vehicles, a gain of more than 15 per cent over the previous high shipping record made in May, 1920, and an increase of 100 per cent over shipments in May, 1921. In cars shipped and orders booked, May was the most successful month the Packard company has had in twenty-three years of operation.

Sales in the retail field in the month amounted to \$5,600,000. Orders on the books as of June 1, 1922, are reported to cover all single-six cars that can be produced in the next three and a half months. Twin-six deliveries are reported to be a month behind. The truck department is reported to be receiving more inquiries than for several years.

## 200 PER CENT GAIN BY GARDNER

ST. LOUIS, June 13—Gardner Motor Co. reports a gain of 200 per cent in shipments in the five months ended June 1, over the corresponding period in 1921. Unfilled orders on hand will require capacity production until Aug. 15. Distributors and dealers report a big gain in sales.

## GEORGE E. MCGINNESS BURIED

CLEVELAND, June 13—Funeral services for George E. McGinness, purchasing agent of the Chandler Motor Car Co., who died Sunday, were held to-day from the family residence, in Cleveland Heights. McGinness had been with the Chandler company since its organization.

## BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

Call money rates last week showed considerable ease. The range was from 3 per cent to 4½ per cent as compared with 4 per cent to 5½ per cent the previous week. Toward the end of the week call money was reported to have been placed on the outside market at as low as 2½ per cent. Time money rates also tended downward. At the close of the week loans for 60 days were quoted at 4 per cent 90 days, 4 and 5 months, at 4 per cent to 4½ per cent and 6 months at 4½ per cent, as against 4 per cent for 60 days and 4 per cent to 4½ per cent for other maturities the week before. Federal Reserve discount rates remained unchanged. A uniform rate of 5 per cent for all classes of discounts prevailed at Minneapolis, Kansas City and Dallas, while 4½ per cent is the uniform rate for all other Federal Reserve Banks.

For the purpose of bringing the rate paid on deposits in line with that at which the banks can lend money, the New York Clearing House adopted, on June 13, a new schedule providing for a reduction in the average deposit interest rates paid by New York banks. The new ruling extends to all classes of deposits, the sliding scale based upon the Federal Reserve Bank commercial paper rate which formerly applied only to deposits by banks, trust companies and private bankers. Mutual savings banks, including all such institutions, and not merely those in the Second Federal Reserve District, are favored over corporations to the extent of ½ of 1 per cent, under existing conditions, by virtue of a differential which has been created.

The Federal Reserve Banks in their statement as of June 7 showed an increase of \$2,451,000 in gold reserves.

Nearly all the European exchanges declined last week, probably in the main a result of the report of the Committee of Bankers in Paris stating that in their opinion an international loan to Germany is not feasible at the present time.

Exports from the United States in May, \$308,000,000, were \$10,000,000 less than exports in April.

Sale of Maibohm Motors  
Awaiting Confirmation

TOLEDO, June 14—Federal Judge Kilts has not yet confirmed the sale of the Maibohm Motors Co. assets to a new corporation called the Arrow Motors Co., which was organized by a creditors' committee. He is expected to hear the appeal from the decision of a referee in bankruptcy confirming the sale when he returns to this city late this week.

Objections to the confirmation have been filed by H. C. Maibohm, president of the Maibohm company, and T. W. Cushing, vice-president. They are said to be backed by a firm of New York brokers, which stands ready to refinance the old Maibohm company.



## Decision Followed by Bakelite Merger

Parties to It Will Continue to  
Make and Sell Products  
Separately

NEW YORK, June 14—The Bakelite Corp. has taken over the General Bakelite Co., the Condensite Co. of America and the Redmanol Chemical Products Co. The merger is the result of a suit for infringement of the Bakelite patents brought against the General Insulate Co. of Brooklyn, one of the customers of the Redmanol company.

This suit resulted in a victory for the Bakelite company when a decree in the United States district court broadly sustained the Bakelite patents covering the molding of phenolic condensation products by heat and pressure and the use of fibrous bodies in such products.

The decision made it impracticable for the Redmanol company to continue in business, and it was decided to consolidate its business, including the personnel, with that of the General Bakelite Co. The Redmanol company had purchased, in the meantime, a controlling interest in the Condensite company which made possible the inclusion of that company in the merger. In many respects the products of the three companies are not identical, and each of the three will continue separately to manufacture and market its products.

Dr. L. H. Baekeland is president of the new Bakelite corporation. The vice-presidents are Philip Schleussner, A. Karpen and Kirk Brown. Brown is general manager. The offices of the corporation are at 8 West 40th Street, New York.

## 300,000 Willys-Knight Engines, Plan for 1923

PONTIAC, June 14—The Wilson Foundry & Machine Co. has been directed by John N. Willys to prepare for production next year of 300,000 Willys-Knight engines. Willys made an inspection of the plant this week and declared the increased schedule should start in the fall to build up a reserve in preparation for enlarged operations at Toledo.

The increase will call for an expansion of the Pontiac plant, with additions to the test house and the assembly floors, as well as larger machine departments. The schedule now is 178 daily, but that point has not yet been reached. It was only 25 a day in March.

"There is no prospect of a let-up in operations this summer," declared General Manager Wilson. "Mr. Willys is especially optimistic."

## CADILLAC SETS HIGH MARK

DETROIT, June 13—A high mark for one day's output in the production record of the Cadillac Motor Car Co. was

## EMPLOYMENT GAINS

DETROIT, June 12—The Employers Association reports a further increase of 2900 in the total employment this week. The increase represents an addition of 145,000 payroll hours. The total association roster of 173,026 is approximately 60,000 greater than the corresponding week of last year and is only 16,000 less than the total for the corresponding week in 1920.

reached this past week when 150 of type 61 cars were made and shipped in 24 hours. More than half of this number were closed bodies.

The value of the day's output was over \$700,000.

The total number of men now employed at the Cadillac plant is approximately 8000, and additional men are being taken on at the rate of 50 a day.

## INDUSTRIAL NOTES

Martin-Parry Corp. will offer dealers in and surrounding Los Angeles, Minneapolis and Baltimore additional distributing and servicing facilities as soon as buildings now contracted for are prepared to handle the work. Recent negotiations have expanded the service of the corporation in Omaha, Salt Lake City and Denver. The corporation has broadened its manufacturing facilities through the acquisition of new interests in Lumberton, Miss. Additional mills secured there will eliminate much rehandling and excessive freight costs as formerly have been necessary. It is expected that before the end of the year there will be in operation more than fifty servicing and distributing plants throughout the country.

Simplex Rims Co. of Delaware, incorporated in that state for \$1,000,000, has also been incorporated in Missouri with a capital stock of \$100,000 and with headquarters at Kansas City. The company will manufacture and sell Simplex rims, as well as accessories, and under certain letter patents will convert other rims for automobile tires into Simplex. The company expects to establish agencies in Missouri and sell territorial rights to agents.

Van Wheel Corp., Syracuse, maker of cast metal hollow spoke automobile wheels, has moved its factory to Oneida, N. Y., where operations have been resumed on a larger scale. The offices of the company will remain in Syracuse for the time being. T. G. Meachem, former vice-president of the New Process Gear Co. and president of the Palmer-Moore Co., is president of the company.

Cleveland Duplex Machinery Co., Inc., Cleveland, has been appointed exclusive representative by the Diamant Tool & Manufacturing Co., Inc., Newark, N. J., in connection with the sale of punch and die sets for the northeastern section of Ohio.

H. L. Rackliff Co. of Cleveland and New York, automotive marketing counselor, has been retained by the Dayton Automotive Wheel Co. of Dayton to assist in the company's marketing plans.

## METAL MARKETS

Once more the automotive consumer finds himself confronted with a steel market of decidedly dual character. In the sheet market the chief producing interest adheres to previous quotations while the independents are asking irregularly higher prices. The latter are apparently judging each inquiry upon its own merits, and the advance asked over the Corporation's prices depends upon the desirability of the account, the specifications, and the backlog of orders on the books of the individual producer. In one respect, however, there appears to be more or less unanimity. The Corporation has so far refrained from committing itself on sheet orders beyond July, and even at the higher prices asked by the independents the latter appear not eager to encumber their order books with commitments for the second half of the third quarter.

At the same time the preponderance of opinion among independent sheet rollers inclines to the view that there is very little likelihood of any runaway market conditions developing during the year's second half. Producers are simply adopting the same methods which automotive consumers practiced in their buying earlier in the year. Producers do not want to have their hands tied any more than is absolutely unavoidable. The automotive industries continue short of sheets, and rollers are being constantly appealed to to speed up shipments. While the sheet industry as a whole has not yet reached 100 per cent of capacity in its operations, the capacity of the pickling and finishing departments is taxed to the utmost and the limit in output of full-finished automobile sheets has been reached long ago, so that here and there consumers have sought to make common black sheets do. This, however, usually proves a failure.

Most of the producers of full-finished automobile sheets are now quoting 4.75c. for 22-gauge body stock, an advance of \$5 a ton over previous quotations. With the sheet bar market having apparently settled on a \$35 basis, non-integrated rollers of full-finished sheets are in fairly comfortable position as regards the price of their principal raw material, although the supply of sheet bars is at times rather tight. Concurrent with the advance in sheets, there have been advances in the prices of virtually all automotive steel products, such as strip steel, cold-drawn steel bars, etc.

Pig Iron.—Although the foundry market is practically in abeyance, blast furnace interests continue very optimistic and prophesy a very heavy movement after July 1, when freight rates will be lowered.

Steel.—Makers of cold-drawn steel bars are working double turn full time to satisfy the automotive demand, orders ranging from 100 to 1,000 tons. Spring steel is moving in heavy tonnages to automotive plants. Most of the independents are now asking 4¢, base Pittsburgh, for cold-rolled strip steel; they expect that the chief interest will follow suit. Some makers of hot-rolled strip are quoting as high as 2.40¢, base Pittsburgh. Many orders are being turned down or accepted in part only because makers fear to commit themselves beyond the raw material they have in sight.

Aluminum.—Very little change is noted in the conditions surrounding the aluminum market. The whole future of the metal is wrapped up in the tariff developments.

Copper.—Automotive consumption is well maintained. On the whole the market is quiet and fairly steady.

# Calendar

## SHOWS

Nov. 13-18—Chicago, Annual Show and Meeting of the Automotive Equipment Association.

## FOREIGN SHOWS

March 10-July 31—Tokio, Japan, Peace Exhibition.

July 1-24—London (Olympia), Aircraft Exhibition.

Sept. 1922—Rio de Janeiro, Brazil, Automobile Exhibits in Connection with the Brazilian Centenary Association Automobilista Brasileira.

Sept. 15-20—The Hague, Automobile Show.

Sept. 25-Oct. 3—Berlin, Automobile Show at the Kaiser-

damm Hall under the auspices of the German Automobile Manufacturers Association.

September—Buenos Aires, Argentina, Annual Exhibition, Sociedad Rural Argentina.

Oct. 4-15—Paris, Automobile Show, Grand Palais.

Nov. 3-11—London (Olympia), Automobile Show.

Nov. 10-Dec. 19—Brussels, Automobile Show, Palais de la Cinquantenaire.

Nov. 29-Dec. 4—London (Olympia), Cycle and Motorcycle Show, British Cycle Motors, The Tower, Warwick Road, Coventry.

November—Buenos Aires, Argentina, Annual Exhibition, Automovil Club Argentino.

## RACES

July 15—Strasbourg, French Grand Prix.

## CONVENTIONS

July 17—Baltimore, meeting, representatives of highway departments of ten Eastern states.

June 19-20—Detroit, Summer Convention of the Automobile Body Builders Association.

June 19-24—Colorado Springs, Summer Meeting, Automotive Equipment Association.

June 26-July 1—Atlantic City, Twenty-fifth Annual Meeting of the American Society for Testing Materials, Chalfonte-Haddon Hall Hotel.

August 28-Sept. 2—Detroit National Safety Congress.

Sept. 18-23, 1922—Rome, Italy, Second Annual Meeting of the International Chamber of Commerce.

Sept. 13, 14, 15—Annual credit meeting, Motor and Accessory Manufacturers Ass'n.

## S. A. E. MEETINGS

June 20-24—White Sulphur Springs, W. Va., 1922 Summer Meeting of Society of Automotive Engineers.

## Northwest Sales Off After Record Month

Spring Business, However,  
Showed Earlier Development  
This Year Than Usual

MINNEAPOLIS, June 12—Automobile dealers in the Northwest have been wondering where all the money came from that participated in the recent raid on stocks of motor cars. They have discovered that it has been dug out of socks, tin cans, kitchen stoves and other hiding places, where people who were afraid of banks, of the business future, of themselves and everything else have been keeping it. The sun of prosperity having risen and begun to dispel the clouds of gloom, these people have begun to come to themselves and are holding private resurrections of cash.

However, except where distributing agencies and factory corporations have been financing dealers, there is still a lack of money to pay for small car shipments from distributors. The bankers either have not the money or will not let loose of it.

This spring spurt in business, which has developed a shortage of cars with dealers and their distributors, has come earlier than usual, so that many report May as a record month. By the same token this business has receded about a month earlier than usual, and another spurt is not expected until the bumper crop on the way is assured and perhaps partially liquidated.

## Sales in Texas Increase 10 Per Cent in Half Month

DALLAS, TEXAS, June 13—There was a considerable improvement in the automotive business in Texas during the past 15 days. Sales by retail merchants showed an increase of some 10 per cent over the preceding 15 days.

The real reason appeared to be the fact there is more money in the country. East Texas farmers are now marketing a \$15,000,000 fruit and canteloupe crop, and

they have already sold or contracted to sell \$10,000,000 worth of berries and tomatoes. Northeast Texas and southwest Texas are marketing \$10,000,000 worth of potatoes, and west Texas has sold a big wool crop. The people in these sections are in the market for automobiles, and the dealers have not overlooked the bet.

## Goodyear Produces 45,000,000th Tire

AKRON, June 9—The Goodyear Tire & Rubber Co. has turned out its 45,000,000th tire.

Tire No. 45,000,000 was taken from the moulds at ten o'clock on the morning of June 8, marking the greatest number of tires produced by any company in the world.

The tire will be exhibited in the company's rubber museum in Akron. It was built with the assistance of Vice-President and Factory Manager Paul W. Litchfield, while President E. G. Wilmer, Vice-President George M. Stadlerman and other Goodyear officials looked on, and when it was completed the Goodyear factory whistles were blown for 45 minutes.

## ASK HICKS-PARRETT BANKRUPTCY

CHICAGO, June 9—A petition in bankruptcy was filed yesterday against the Hicks-Parrett Tractor Co. of Chicago Heights, Ill., by three creditors, whose claims aggregate \$657. Officials of the company said they hoped the claims could be adjusted without going through the bankruptcy courts. The company has been operating only on a small scale for some time.

## R. C. O'BRYAN SENTENCED

OMAHA, June 13—R. C. O'Bryan, executive head of the defunct Great Western Commercial Body Co., recently tried and found guilty in district court of conspiracy to defraud the public in the sale of that concern's stock, has been sentenced by Judge Goss to a year in the state penitentiary and to pay a fine of \$1,000. His attorneys immediately gave notice of an appeal.

## Signs Guide Dealers When Visiting Stutz

Catalog Is Also Used to Give Visitors Better Understanding  
of Factory

INDIANAPOLIS, June 10—At a two-day sales and service conference of the Stutz Motor Car Co. of America the first day was devoted to talks by department heads with a trip through the factory as the end of the formal sessions. In the factory visit a rather novel plan was followed. The entire factory was labeled with signs and legends for each department. It was numbered also to key with a brief catalog somewhat on the lines of a simple art catalog.

Along with each exhibit legend in the catalog the name of the foreman in charge appeared, and he formally met each visitor. While every factory introduces department heads, the foremen are often neglected for one reason or another.

"That is wrong," says Fred Wilson, general sales manager, who was responsible for the plan. "The way to do it is to introduce each foreman so that in the future that department will have a personal existence to the dealer and service man."

Another innovation introduced in the factory visit was a sheet upon which was listed the number of pieces in the Stutz, those purchased finished, the number of assemblies made in the plant, the number of holes drilled, reamed and tapped, the number of pieces of various sorts of metals and materials, etc.

This list gave the visitors an impression of the magnitude and multiplicity of operations and materials and parts handled and work done upon them. Also it gave them a quick view of the proportions of the car and assemblies made in the plant, so that they could form a conception of the factory before they reached the first department.

Besides the guides, one to every four visitors, each dealer was supplied with a miniature catalog that described the twenty-two main departments.